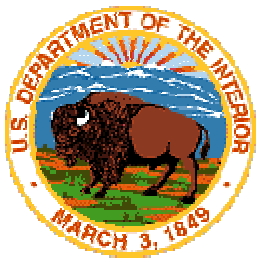

NATIONAL INTEGRATED LAND SYSTEM

SURVEY MANAGEMENT AND MEASUREMENT MANAGEMENT

RELEASE 1.1

SOFTWARE REQUIREMENTS SPECIFICATION

JUNE 10, 2002

L&RPO: NILS-XXX-SRS-V1.02-001-061002

DRAFT 1.02

UNITED STATES DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT
LAND & RESOURCES PROJECT OFFICE
DENVER FEDERAL CENTER
DENVER, COLORADO 80225-0047

Software Requirements Specification Signature Sheet

The Software Requirements Specification (SRS) for the National Integrated Land System describes and specifies engineering and qualification requirements for the system to the best of our knowledge and belief. Upon approval from the individuals listed below, the SRS shall become part of the product baseline for the National Integrated Land System. A copy will be placed under Configuration Management.

TITLE	SIGNATURE	DATE
APPROVED BY:		
LESLIE CONE, L&RPO PROJECT MANAGER		
Pete Culp, Associate Director, Land and Minerals Resource Protection		

REVISION CHART

Version	Primary Author(s)	Description of Version	Date Completed
Preliminary Draft 1.0	Carsten Bjornsson Mark Williams Will Chesser	Preliminary Draft 1.0	April 2002
1.02	Carsten Bjornsson Will Chesser Kate Taylor	Updated to address comments from Jerry Sullivan; remove references to integration with Brio for R1.1	June 2002
1.02.1	Kate Taylor	Removed DP references	June 2002

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1 Scope

1.1 Identification

Project Name	National Integrated Land System
System Name	Survey and Measurement Management
System Abbreviation	NILS SM/MM
System Version Number	1.1
Project Office	Land & Resources Project Office (L&RPO), WO330D
Project Manager	Leslie Cone, Project Manager of Land & Resources Project Office (L&RPO), WO330D
Project Sponsor	Pete Culp, Associate Director, Land and Minerals Resource Protection
System Users	Cadastral and land surveyors; GCDB
System Developer	Environmental Systems Research Institute, Inc.
Supporting Agencies	USDA Forest Service

1.2 System Overview

The National Integrated Land System (NILS) is a joint project between the BLM and the USDA Forest Service in partnership with states, counties, and private industry to provide business solutions for the management of cadastral records and land parcel information in a Geographic Information System (GIS) environment. The goal of NILS is to provide a process to collect, maintain, and store survey and parcel-based land information that meets the common, shared business needs of land title and land resource management. The BLM and Forest Service vision is to make parcel-based land information available for managers, specialists and the public in an organized automated system. An automated national integrated land system will provide both agencies, our partners and the public with better tools for efficient multiple-use management of the national forest and public lands.

Survey Management is a suite of applications that provides surveyors with the ability to manage survey data collected in the field and integrate these with GIS feature datasets. It allows for exporting data to a variety of survey equipment and for importing data back directly into the Survey Management database. Survey Management has an integrated workflow and database allowing for a smooth transition from working with record field data to working with the measurement network.

The objective is to reduce the need for data conversion and reconstruction as measurement features are incorporated into the land records management system.

Survey Management will provide:

- Dynamic tools, allowing users to import and export to a variety of data collection devices
- An effective means of conducting *survey research* to take data into the field via LAN/WAN and GeoCommunicator.
- A *geodetic calculator* to perform computations in the field to locate and calculate coordinates for physical features, i.e. monuments, buildings, and watercourses and to perform QA while in the field.
- The capability of viewing unadjusted data, displaying polygon misclosures, applying known corrections using direction and distance measurement, adjusting the field survey data using a parametric least square adjustment process, and developing and displaying a statistical analysis of the adjustment.
- Coordinate geometry (COGO) geodetic *calculation methods and procedures to perform monument restoration and/or layout*
- A geodetic model to perform parametric least square adjustment (PLSA).
- The ability to create, modify and reuse computations such as a traverse adjustments or PLSA.
- Ability to view s*tatistical analysis* of any adjustments
- The organization of field measurements in *survey projects*
- The ability to display data in both *spatial and tabular formats*.
- The ability to create *survey plats* and *field notes* in an automated fashion.
- An integrated workflow and task assistant aiding the surveyor in completing tasks while in the field or in the office.

Measurement Management is a set of applications that allows for the combination of measurement data from a variety of sources and reliabilities to create a seamless measurement network. Measurement Management shares the same database as Survey Management and extends the workflow to accommodate the adjustment of the measurement network and the creation of the parcel fabric.

Measurement Management will provide:

- The capability to improve the accuracy of mapped features
- The ability to create new features based on survey data
- The creation of a true measurement network and the ability to adjust that network using a parametric least square adjustment process, and developing and displaying a statistical analysis of the adjustment.
- The capability for users to create a higher-quality control network database for both the Public Land Survey System (PLSS) and metes and bounds land environments.

- Tools to input and import data, *construct measured features*, edit measurement data, adjust and analyze the measurement network, perform *least square adjustments*, perform coordinate geometry (*COGO*) and layout,
- Tools to construct section subdivisions and minor subdivisions
- The ability to *create a true parcel fabric* based on surveyed features.
- The ability to display data in both *spatial and tabular formats*.
- The capability to *edit measurement data*, allowing surveyors to work with field data from Survey Management, and include control data from other sources and surveys.
- The *creation of a parcel fabric* and the attribution of polygons with legal area descriptions.

The scope of this document and the Release 1.1 of the Survey Management and Measurement Management (SM/MM) application include an initial subset of the survey and measurement management processes. The GeoCommunicator functionality has been released and is currently in use. Future releases of the software will address the remaining survey, measurement, and parcel management processes.

1.3 Document Overview

This Software Requirements Specification (SRS) contains the requirements and detailed specifications for system development of SM/MM release 1.1.

2 Referenced Documents

The SRS references the following documents:

2.1 Government Documents

NILS Detailed Requirements	July 2001
Survey Management Use Cases	July 2001
Measurement Management Use Cases	July 2001
NILS Concept of Operations and User Requirements (COURS) document	March 2000
Software Security Plan	NILS-XXX-SSP-V1.00.00-000-00000000
Software Design Document	NILS-XXX-SDD-V1.00.00-000-00000000
Initial NILS System Architecture Design	December 2001
Software Test Plan	NILS-XXX-STP-V1. 00.00-000-00000000
Software Test Description	NILS-XXX-STR-V1. 00.00-000-00000000
Software Users' Guide	NILS-XXX-SUG-V1. 00.00-000-00000000
Version Description Document	NILS-XXX-VDD-V1. 00.00-000-00000000
Interface Requirements Specification	NILS-XXX-IRS-V1. 00.00-000-00000000
Requirements Traceability Matrix	NILS-XXX-RTM-V1. 00.00-000-00000000
Data Management Plan	NILS-XXX-DMP-V1. 00.00-000-00000000

2.2 Non-government Documents

The following ArcGIS documents are from ESRI:

Using ArcMap

Using ArcCatalog

Using ArcToolbox

Editing in ArcMap

Managing ArcSDE Services

Building a Geodatabase

3 Engineering Requirements

3.1 CSCI External Interface Requirements

No external interfaces will be required for SM/MM release 1.1.

3.2 CSCI Capability Requirements

Specifications for SM/MM Release 1.1 are contained in Appendix A. Each specification will contain, when applicable, the following items: Title, Purpose, Requirement, Description, and References to other documents. Additional headings may occur in the detailed specifications for the individual Computer Software Unit (CSU) of the specification. The numbering scheme defined in the appendix provides a unique identifier for each requirement. The Requirements Tracability Matrix cross-references this number to the original detailed requirements and use case documents referenced in section 2.1 above.

3.3 CSCI Internal Interfaces

Data is exported to a set of standard file formats for use with field data collection devices and the WinGMM software. For details on the specifications for these file formats please refer to Appendix C.

3.4 CSCI Internal Data Element Requirements

A list of all data entities and attributes is described in the Data Management Plan.

3.5 Sizing and Timing Requirements

System performance must meet the requirements specified in Appendix A of this Software Requirements Specification or the Software Test Plan.

3.6 Security and Privacy Requirements

There are several levels of data and application security addressed within the SM/MM application. The Relational Database Management System (RDBMS) and ArcCatalog applications manage data access privileges. These access privileges are organized into *groups* with member *users* whose privileges are defined by the group privileges. User level security will allow users to add/modify/delete data associated with the group level to which they have been authorized. Each group level grants its own privileges plus the privileges of all levels below it in the hierarchy.

The NILS security implementation will also manage user access to specific tools and functions based on a user's role in one or more application access groups. These application access privileges will be based on Windows NT/2000 authentication and will be integrated and coordinated with the data access privileges. The security implementation for application level access will be integrated with the BLM's strong password security component.

Administrators/Supervisors will have privileges associated with such functions as setting defaults for their system. The system owner will have privileges such as updating the database schema and managing group and user access.

Details of the security requirements are outlined in the Software Security Plan (SSP).

3.7 Design Constraints

The SM/MM application will be based largely on ESRI's COTS ArcGIS software and the Survey Analyst extension to ArcGIS. The software operates in a Windows desktop environment. Development will be based on the ArcGIS component object model.

The software development environment also includes the following:

- **Windows 2000 Professional** (or Server) — Operating system for client applications
- **Microsoft Visual Studio 6.0** (Visual Basic and Visual C++) — Customization of ArcGIS
- **Infragistics UltraSuite** v 2.0 or higher — Development of custom navigation grids
- **Active Desktop Objects** (ADO) v 2.5 or higher — Communication with Informix
- **Active X compliant reporting tool** — Report display

The system requirements include the following:

- **Client**
  Windows 2000
  Active Desktop Objects (ADO) v 2.5 or higher
- **Application server**
  Windows 2000
  ArcGIS v 8.2 or higher
  ArcScan
  Survey Analyst v 1
  ArcIMS 3.1 or higher
  Internet Information Server v 5 or higher
  Internet Explorer 5 or higher
  Active X compliant reporting tool
  Active Desktop Objects (ADO) v 2.5 or higher
  Citrix Metaframe Server and ICA
- **Database server**
  Sun Solaris 7 Kernel 16
  Informix 9.21 UC4 with OBDC driver
  ArcSDE 8.2 or higher

3.8 Software Quality Factors

With each COTS software product release, ESRI's primary goal is to deliver a high quality product. The quality assurance program at ESRI focuses on developing and implementing procedures to ensure that the code is solid, that the software developed is functionally effective, and that all of the software products perform well. Quality assurance is an ongoing process. The effectiveness of the quality assurance procedures are tracked and measured to make sure they are always improving. This is done through comprehensive automated testing using user interface and component level test scripts. Beta testing is also an important part of the quality assurance program because it puts the software through its paces in a real-world setting. Since beta testing may only cover a portion of the code, black box, white box, unit, internationalization (I18N), usability, file integrity, load, ad hoc manual, interoperability, and performance testing, are all used to ensure comprehensive testing.

The following testing is completed for all ESRI COTS products:

1) Component Level Testing. Component level (unit) testing is designed to query/verify the properties and to exercise the methods associated with every software component used to build ESRI products. These regression test scripts are developed by each of the product teams, typically using Visual Basic for the ArcGIS desktop products.

2) GUI Interface Testing. GUI testing is a black-box testing strategy used to verify proper functioning of the User Interface. Product teams utilize GUI test script development software such as SilkTest or Visual Test to record/playback user keystrokes, program complex real-world user scenarios, create tests to verify bug fixes, verify the correct display of fonts, dialogs, captions, and messages (for multiple languages and Nationalities), insure all dialogs and menus operate as expected, simulate use of published tutorials, and greatly reduce the need for manual testing.

3) Output Verification. Another important aspect of software QA is verifying that the disk files created and utilized by the software are created correctly and remain correct whenever data is manipulated. This is accomplished using test software developed in-house (Snoopy, AVRaider, GeoCompare) to compare all of the various project files, shape files, data base files, etc. associated with the software.

4) Ad Hoc Development Testing. ESRI programmers use a variety of third-party software tools to ensure the code they develop is solid and performing. These tools include Purify (memory leak tool), Quantify (profiler), Boundschecker (memory leak), Bug Trapper, and others.

5) Ad Hoc Manual Testing. Product specialists perform ad hoc manual testing of new functionality to verify design execution, software completeness, ease of use, and proper interoperability with related operations and software.

6) Beta testing. Beta releases seek to validate the performance, quality, and reliability of all aspects of the software, including the documentation. Testing these early releases exposes software to a wide variety of application environments prior to final release and gives beta testing sites the opportunity to suggest software improvements.

7) Usability Testing. Usability Testing is a process where representative users are involved in evaluating a product. Typically, an individual user will be asked to use a product that is under development. The product is evaluated for its ability to enable the user to perform everyday work tasks efficiently and effectively. The session usually lasts about two hours and is videotaped. Later, the video will be studied to find areas in the product that need improvement. Usability Specialists are interested in the amount of time it takes to complete a task, the number and severity of errors made and their cause, and how satisfied the user is with the product's design.

8) User visits and review. For key parts of the software, the ESRI Development staff will arrange site visits and meetings with users to review software designs and implementations and to compare these against real implementations. This will lead to critical (and often very simple) improvements so that software works in real user settings.

9) Performance Testing. ESRI conducts performance tests to ensure that the software meets baseline standards.

10) Enterprise and Stress testing. To the maximum extent possible, ESRI will build stress tests to exercise the software in large enterprise environments by attempting to replicate multi-user scenarios.

Custom applications and extensions to the ESRI COTS software developed for the BLM will undergo testing as described in the Software Test Plan referenced in Section 2.1.

3.9 Human Performance/Human Engineering Requirements

ESRI has created a web site to offer comprehensive information about ESRI software in relation to Section 508 of the Rehabilitation Act of 1973. The site is updated as new information becomes available. The site is located at http://www.esri.com/software/section508/position.html

3.10 Requirements Traceability

The Requirements Traceability Matrix (RTM) identifies where, in the design, the stated requirements have been addressed.

4 Qualification Requirements

4.1 Qualification Methods

Demonstration	The National Integrated Land System shall demonstrate that the developed system meets the requirements identified in this specification
Test	Unit testing, integration and interoperability testing, and Formal Qualification Testing (FQT) shall be performed according to the methods and standards outlined in the Software Test Plan (STP) and Software Test Description (STD) documents listed in section 2.1 of this document
Analysis	Errors encountered shall be tracked, corrected, and re-tested according to the methods and standards outlined in the STP and STD documents listed in section 2.1 of this document

4.2 Special Qualification Requirements

None identified.

5 Preparation for Delivery

Executables and installation programs for SM/MM release 1.1 will be provided to the BLM in advance of FQT testing and training. To access the NILS application, users will need access to ArcGIS and Survey Analyst licenses. The application will be installed on a Windows Terminal Application Server as described in the NILS System Architecture Document.

6 Glossary

SRS Glossary	
Adjustment fusers	Calculation of the relation between expected qualitative descriptors and calculated quality descriptors that exceeds a certain threshold value.
Alias	One of several possible ways to define a parcel as the sum of its constituent parts.
Aliasing	The ability to define a parcel by a number of different alias combinations.
Aliquot part	Division of land formed by the halving and quartering of PLSS lands.
Area of Interest	A named geographic extent used to define the boundaries of an investigation area for the streamlined map navigation and query.
Boundary	A polygon edge feature or a polyline feature. Boundaries from several feature classes may be used to define the boundaries of polygon feature in another feature class.
Closure	The extent to which and adjustment between known coordinates anticipates these coordinates described as residuals in dX, dY, dXY and relative error rE
Compass adjustment	This is a standard surveying adjustment method.
Coordinate Geometry (COGO)	A GIS-oriented set of functions for surveyors to enter survey data, to calculate precise locations and boundaries, to define curves, etc. May be used for managing land records, mapping parcels, assessing property, reviewing development, and creating cadastral and engineering basemaps.
Derived status	The land status of a Parcel as determined by a thorough analysis of feature lineage, action events, and past status and their respective cumulative impacts as defined by standardized land status precedence and relevance rules.
Encumbrance	A limit on the rights and use of the land.
External application	A software application used in to complete BLM/FS business activities, but which is not an integrated part of the NILS system. Users might interact with external applications during a placeholder task in a Job process flow.
Fabric	Abstract term referring to the collection of feature classes and features that make up the of the spatial data notions in the GIS. The three fabrics are the Survey fabric, LD fabric, and Parcel fabric. The collection of datasets that comprise a fabric generally comprise a more or less seamless set of tessellated features with common edge topology rules, although in some cases features may overlap.

SRS Glossary	
Feature	A shape in a spatial layer, such as a point, line, or polygon that represents a geographic object.
Feature geometry	The definition of a feature's shape.
Feature link	Functionality supported by the Spatial Analyst extension that allows vertex coordinates in one layer to be automatically updated when its referenced survey point is updated. This functionality will be used to update the LD fabric when the Survey fabric is updated.
Feature linked annotation	Text that is related to a feature and whose lifespan, placement, and content relies on the features own lifespan, placement, and attributes.
GCDB	The Geographic Coordinate Data Base is a collection of geographic information representing the Public Land Survey System (PLSS) of the United States. The GCDB grid is computed from BLM survey records (official plats and field notes), and local survey records.
Georeference	The act of registering image or vector data to base mapping data with a known coordinate system in order to align the data so that it reflects their real-world spatial relationships.
Irregular boundary adjustment	Adjustment method that applies single proportion calculation by on a meridional line the latitude of the closing distance is distributed among the courses in the proportion of the latitude of each course. The departure of the closing distance is distributed among the courses in proportion to the length of each course.
Job	The discrete deliverable defined by a process. The system will allow for the definition of the user's regular activities as jobs. To complete a project one or more jobs will need to be completed. Users will complete jobs by completing each task in the job's process. Several jobs can be worked on in parallel.
Job status	On an abstract level, the extent to which a job is complete. This will usually be defined by the number of constituent tasks in its process have been completed.
Land Status	A method of classifying land to determine what rights have or have not been allocated. Each category of Land Status is derived by searching for events on the land that were conducted under authorities affecting the category of Land Status being derived and then accumulating the effect of the actions.
LD fabric	This is an abstract term that refers to all of the LD Feature Classes. An adjusted measurement network to which constructions (terrain feature boundaries, non-survey data) have been added. All polygons representing legally described areas have been formed from the measurement network and other boundaries to support the parcel fabric.

SRS Glossary	
LD text	This is a written description of the legal boundaries of a piece of land.
Least squares adjustment	A mathematical process that simultaneously combines all *measurements* in a *data set* and adjusts their residuals to derive the optimal value as well as statistics that include the reliability of each derived value.
Legal Description (LD)	The textual or geometric representation of a piece of land which defines its boundaries for use in the judicial definition or transfer of rights.
LR2000	Legacy Rehost 2000. Re-implementation of BLM's legacy systems, Case Recordation/ORCA, Mining Claims, Status and Legal Land Description on Y2K-compliant systems and in an Internet-based environment.
LSI	The Land Survey Information (LSI) Web site contains a collection of geographic information from the Bureau of Land Management's (BLM) Geographic Coordinate Data Base (GCDB) representing the Public Land Survey System (PLSS) of the United States.
Master Title Plat	Plat map showing parcel boundaries and status of BLM lands
Measurement data	The raw measurement files with control points, coordinate files, survey source IDs, error estimates, and/or survey business rules that are associated with a measurement data set.
Measurement network	A set of topologically related *measurements* (coordinate points and lines) and constructions (area-based *features*, non-surveyed *features*). May be in various states of connectivity and adjustment.
Notification	An email message automatically sent to interested parties when one of a set of predefined events occurs within the system.
Parcel fabric	This is an abstract term that refers to all of the Parcel Feature Classes.
Placeholder task	Refers to a workflow Task that a user will complete off-line or outside of the system. The purpose of Placeholder Tasks is to capture a Task that is an integral part of completing a Job, but which the system does not support directly. An example might be to a signature and review step that must be done before further work on a Job can proceed and is perform offline on a hardcopy document.
Process	The tangible implementation of a workflow within the system. Central administrators will create a process for each job. Processes are defined from a rigid series of tasks and nested tasks. All of the tasks in a process must be completed to finish a job.
Public Land Survey System	Public Land Survey System. A set of baselines and principal meridians that define more or less rectangular divisions of land into Townships, Sections, and aliquot parts.

SRS Glossary	
Reduction	The process of reducing the amount of data into an evaluable term.
Reliability	Data describing the ellipse surrounding an adjusted point's coordinates that represent a statistical chance that the true coordinate values will be within the ellipse. Ninety-five percent chance is a usable measure.
Residual values	1. The difference between any value of a quantity in a series of observations, corrected for known systematic errors, and the value of the quantity obtained from the mean or other adjustment of that series. [ACSM] 2. They [residuals] are similar to errors, but errors are obtained by subtracting the true value, rather than the best possible value, from the measurements. [Moffitt and Bouchard]. 3. The difference between any measured quantity and the most probable value for that quantity. It is the value which is dealt with in adjustment computations, since errors are indeterminate. The term 'error' is frequently used when 'residual' is in fact meant, and although they are very similar, there is a theoretical distinction. [Wolf]
Restriction	Defines what land cannot be used for. A limitation on land use.
Right of way	Right-of-way is the legal right to cross the lands of another. Also, used to indicate the strip of land for a road, railroad, power line, or easement.
Rights	Claims to land. A right may be an access right, an extraction right, or an easement, for example.
Robusting	A technique in *least square analysis/adjustment* where data discrepancies are localized to where they occur rather than the normal smoothing out over a large area. This is a technique to locate blunders.
Role	The capacity under which a user is interacting with the system. Directly relates to the user's respective user group membership(s).
SFF	A set of six standard file formats (SFF) generated by the GCDB data preparation application. - .RAW including the measurement data - .SID including error estimates for measurements and comments - .DEF including projection information - .AN including annotation information - .LX including adjusted coordinates and equivalent reliability values - .MET including standard meta information descriptors
Snoop	A snoop value is determined by dividing the residual of a measurement computed during a least squares adjustment by the error estimate. The snoop option in Least Squares Analysis report the statistical analysis of the error estimates and snoop values of a least squares adjustment based on the

SRS Glossary	
	individual source IDs (SIDs) in the source- level data used by the least squares adjustment.
Survey fabric	This is an abstract term that refers to all of the Survey Feature Classes.
Survey project	This is an organizational/system concept to represent a set of field activities. It's where and how all the relevant data and files are stored for future use. A Survey Project may be comprised of one or more *Field Surveys*.
Task	A task is a discrete step in a workflow. Job processes are made up of a series of tasks.
Task status	Defines whether a task is complete or incomplete.
Topology	The spatial relationship between connecting or adjacent features in one or more geographic data layers. Topological relationships are used for spatial modeling operations that do not require coordinate information.
Transit rule adjustment	This is a standard surveying adjustment method.
Unconstrained adjustment	A least squares adjustment using only one point of control.
User group	One of a number of collections of individuals who share responsibilities and privileges and are subsequently granted similar access rights to carry out system tasks and access and edit system data.
Weightings	Numeric values that are used to restrict the amount of adjustment of a measured value, based on the confidence in the measurement's reliability. A highly reliable *measurement* will have a small 'error estimate' and is referred to as being 'more weighted' than unreliable data. Surveying Weight. The relative reliability (or worth) of a quantity as compared with other values of the same quantity. If one value of a quantity has a weight of 2, and another value of the same quantity has a value of 1, the first value is worth twice the second value, and a mean value would be obtained by taking the weighted mean - twice the first value plus once the second value, the sum being divided by 3. [ACSM]
Wizard	A software user interface that leads the user through a series of steps toward a goal
Workflow	The conceptual set of start-to-finish steps that must be completed to deliver a discrete item of work. These are generally ordered and linear.

7 Acronyms

SRS Acronyms (in progress)	
ADA	Americans with Disabilities Act
AOI	Area of Interest
CDCS	Cadastral Data Content Standard
COTS	Commercial Off the Shelf
CSCI	Computer Software Configuration Item
FGDC	Federal Geographic Data Committee
GCDB	Geographic Coordinate Data Base
GMM	Geographic Measurement Management software
LD	Land Description
LLD	Legal Land Description
LSI	Land Survey Information
PLSS	Public Land Survey System
RDBMS	Relational Data Base Management System
SFF	Standard File Format
SM/MM	Survey Management/Measurement Management

Appendix A: CSCI Capability Requirements for SM/MM Release I

The following are global statements that apply to all requirements in this appendix:

- There are virtually hundreds of SM/MM requirements that are met by the COTS ArcGIS and/or Survey Analyst functionality. In general ,these common GIS requirements are not included in this document. For example, there is no specified requirement in this document for pan and zoom functionality. However, all functionality available in the COTS product will be available to the user. Further detail on the specific design and user experience for these functions is available in the ArcGIS documentation listed in section 2.1 of this document.

  Those few COTS GIS functions that are specified in the previous NILS and SM/MM requirements and use cases are included, however, for completeness and traceability.

- The Reference for each of the requirements lists the Detailed Requirements (DFF) and original Use Case(s) from which the requirements have been derived and/or defined. The DFF requirements are indicated with a single letter prefix as specified in the DFF, the use case references are indicated with a double letter prefix, as indicated in the use case documents. See the documents listed in section 2.1 for more information.

- An initial assumption about the implementation methodology has been provided for each requirement. Five general categories were used, as follows:

  1. Requirement will be met by COTS functionality.
  2. Requirement will be met by the configuration of COTS functionality.
  3. Requirement will be met by the development of new custom extensions to ArcGIS.
  4. New development may be required to meet this requirement.
  5. Requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

- Appendix B provides a summary of all requirements.

Security General Capabilities

Purpose:

Control access to functionality and data.

General Requirement:

Ensure tasks and data are accessed only by users with the appropriate permissions.

USERS

R1.1 Multi-user Environment

Purpose:

Ensure the distributed system is available to multiple users simultaneously.

Requirement/Description:

The system shall support a multi-user environment in which data and databases will be distributed.

Simultaneous users in disparate locations will be able to access the same data for use and analysis within the system even though the data may exist on local drive or on network drives or relational database systems in different locations.

Reference:

G4.5

Comment:

Although the current plan is to centralize the system databases it will still be necessary to integrate with distributed data and the requirement remains relevant. See Initial NILS System Architecture Design.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.2 Administer Permissions

Purpose:

Ensure the access privileges to tasks and data are only available to those users for which it is appropriate.

Requirement/Description:

Provide support for administering user permissions according to both individual and group level access restrictions. The system must use the agency's existing security module.

Users with administrator permissions will be able to define membership within User Groups and in turn define which User Groups are able to access various task functionality and data.

Database permissions will be administered with standard ArcSDE COTS functionality however significant effort is required to insure that these database permissions are synchronized with User Group task functionality access permissions. For further information regarding this synchronization reference the requirement Discrete Access.

Reference:

G4.5

Comment:

The BLM/FS is responsible for defining the task responsibility and data access rights of the User Groups for the jobs provided for R1. ESRI needs access to the working security module, or at least a documented test harness, as soon as possible to begin integration investigations.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.3 Enforce User Groups

Purpose:

Ensure access permissions are defined on the User Group level and that these permissions are enforced.

Requirement/Description:

The system shall manage and enforce user roles securely. User roles shall limit the users' capabilities within a job workflow process and the user will be authorized to use the workflow system. Responsibility for job tasks and the capability to complete tasks will be administered on the basis of User Group membership. The system will use the agency's existing security module.

Users interacting with the system by accessing workflow tasks will only be able to access task functionality that they have privileges for as defined by their User Group membership. Users attempting to access tasks that they do not have permissions for will be restricted from accessing this functionality.

Reference:

G6.4, Meeting with BLM staff, ESRI-Redlands 3/14-15.

Comment:

The BLM/FS is responsible for supplying the task responsibility and data access rights of the User Groups for the jobs provided for R1. (This information needs to be available at the time of installation)

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

Database Design General Capabilities

Purpose:

Ensure the database design can support the functionality required of the system.

General Requirement:

The database model should support the functionality that is being developed for the system in Release 1.

DATA

R1.4 Manage Data Content

Purpose:

Ensure all entities, both features and objects, are represented within the system database model.

Requirement/Description:

The core data model for the system will comply with the specifications contained in the Data Management Plan (DMP) and with FGDC standards.

Users will be able to interact with instances of the database entities specified in the DMP. For a complete list of these entities reference the DMP.

Reference:

G1.3

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.5 Persist Source Data and Precision

Purpose:

Ensure no original survey data or inherent accuracy is lost.

Requirement/Description:

The system shall capture and persist the actual source and precision for the high-precision survey data and for data with lesser or unknown precision. Data of unknown precision and high-precision survey data can exist within a single layer.

The user shall be able to access source data for survey-derived data in its original state.

Reference:

G1.11

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.6 Model Feature State

Purpose:

Ensure the database model supports recording and using feature state.

Requirement/Description:

Provide a data model that enables the management of the state of a feature.

Reference:

G1.16

Comment:

The state of a feature is an attribute that records whether a feature is provisional, approved, or retired. Unless otherwise specified during the review of the SRS, this requirement will be interpreted as stated.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.7 Model Inactive Parcels

Purpose:

Ensure the database model supports the representation and use of parcel features that are no longer active.

Requirement/Description:

Provide a data model for managing inactive and historical parcels.

Reference:

G1.18

Comment:

This requirement differs from R1.6 in that it requires management of the history of the feature state modeled by fulfilling R1.6. Unless otherwise specified during the review of the SRS, this requirement will be interpreted as stated.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.8 Integrate Data Formats

Purpose:

Ensure the model supports the storage, use, and integration of diverse formats of data. See R1.45.

Requirement/Description:

Provide a data model that supports the integration of multiple spatial and image formats.

Reference:

G2.3

Comment:

For a list of formats supported by the ESRI COTS application, please reference the ArcGIS documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

RELATIONSHIPS

R1.9 Maintain Database Relationships

Purpose:

Ensure the integrity of relationships between database entities.

Requirement/Description:

The system shall maintain the relationships between features and objects. The relationships shall be persisted in the NILS database and the system shall maintain referential integrity.

Reference:

G1.12

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.10 Support Specific Database Relationships

Purpose:

Ensure at a minimum the database model includes several necessary relationships.

Requirement/Description:

The data model for the system shall support the relationships as specified in the Data Management Plan.

Users will be able to navigate the relationships between the features and objects specified in the DMP. The actual navigation of the relationships is ESRI COTS functionality, but a significant amount of effort is involved in designing the model to support the relationships, loading the appropriate data, and establishing the relationships. For further information on the specific relationships reference the DMP.

Reference:

G1.3, G1.12

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

TOPOLOGY

R1.11 Manage Geometries in Fabrics

Purpose:

Ensure the topological integrity of feature geometries within parcel and legal description fabrics.

Requirement/Description:

The system must support the management of feature geometries as topologically integrated feature fabrics.

Users will interact with data that presents a coherent view of the spatial relationships of the features and feature layers within the parcel and LD fabrics. This includes the development of edgematching rules and tools for the reconciliation of edgematching errors. The specific rules will be defined in the Data Management Plan.

Comments:

The specifics of the topological rules will be elaborated upon in later specifications as they are largely dependent upon the specifics of the data model that is delivered. The combination of the data model and the defined topology rules must support fabric management.

Reference:

G1.9

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

MODEL

R1.12 Comply with FGDC CDCS

Purpose:

Ensure the database model complies with FGDC data standards.

Requirement:

The data architecture must comply with the Federal Geographic Data Committee's (FGDC) Cadastral Data Content Standard.

Reference:

G1.3

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.13 Published Data Model

Purpose:

Ensure the database model is documented for reference.

Requirement/Description:

The system must have a published object architecture in UML. Softcopy documentation of the database model will be provided with the release. The Data Management Plan will provide specific information on the data model for the survey, legal description and parcel fabrics.

Reference:

G1.1, G1.2

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.14 Partial Data Models

Purpose:

Ensure that a subset or "incomplete" version of the database model can be implemented by cooperating agencies while still allowing for the sharing of data.

Requirement/Description:

The system must support minimal versions of the model.

Reference:

G1.1

Comment:

The core NILS data model will identify required fields that must be included in the subset model for compatibility and integration with the enterprise NILS database.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.15 Data Model Customization

Purpose:

Ensure the model can be changed in order to customize it for specific implementations.

Requirement/Description:

The system must provide tools to customize a base model and derive a schema and database from the model.

Reference:

G1.2

Comment:

The core NILS schema will not be changed without going through the formal change control process, however, the tools for updating the schema when necessary and approved are available.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

DOCUMENTATION

R1.16 Sample Data

Purpose:

Ensure sample data is provided with the model so users can become familiar with a tangible version before implementing the model.

Requirement/Description:

Example implementation data for the database model shall be provided with the system. The data will illustrate the defined database relationships and topology rules for all Release 1 functionality and feature classes.

The data that is actually provided will be specified at a later date as it relies on the specifics of the database model. The amount of data provided will be of a minimal extent required to illustrate the feature classes, rules, and relationships.

Reference:

G1.2

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.17 Database Implementation Guide

Purpose:

Ensure the implementation process is documented.

Requirement/Description:

An implementation guide shall be provided with the system.

This information will be provided in a number of documents: Data Management Plan, Implementation Plan, and the ArcGIS SDE product documentation.

Reference:

G1.2

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

METADATA

R1.18 Record Feature Metadata

Purpose:

Ensure metadata about individual features can be stored so the feature's reliability can be determined in the future.

Requirement/Description:

The system data model shall capture and persist information for each feature to indicate whether it was created from surveyed or unsurveyed features and to allow for the addition of user input regarding feature reliability.

Users shall have the ability to add information about the reliability of individual features when survey fabric features are generated for use later in analyzing the reliability of the features.

Reference:

G1.11

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

Map Display General Capabilities

Purpose:

Ensure the map window provides a coherent, useful, and navigable view of the data.

Capability:
The system shall provide a view of spatial data that integrates disparate formats, and provides for meaningful interaction and presentation of the data.

MAP INTERACTION

R1.19 Display and Navigate

Purpose:

Ensure it is possible to view spatial data in various formats together and that the view extents can be manipulated.

Requirement/Description:

The system shall provide a graphic display of all land-related spatial information and pan and zoom tools to manage the users view of the spatial data. The interface shall provide an integrated, common view of multiple spatial and image data formats. The interface should also provide a capability to hyperlink a document to a spatial feature.

Reference:

G2.1, G2.3

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.20 Select Features

Purpose:

Ensure that it is possible to select features within the system and use those selections in a meaningful way.

Requirement/Description:

The system shall provide tools to select features and manage the selected set. Users shall be able to add or subtract features to and from the selected set, and clear the set.

Reference:

G2.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.21 Display AOIs

Purpose:

Ensure it is possible to view AOIs along with other spatial data.

Requirement/Description:

The system shall provide for the optional display of AOI polygons within the integrated map display. Users should be able to select whether or not to view the extents of the AOI polygon they are referencing in the map view.

Reference:

BLM Meeting, ESRI Redlands 3/14-15, 2002

Predecessor:

R1.34 (AOI Navigation)

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.22 Integrate Table and Map Views

Purpose:

Ensure tabular and map views can be viewed in an integrated environment and that when applicable, they are synchronized.

Requirement/Description:

The system shall provide automatic integration between map features and a tabular report of their attributes. As features are selected or unselected in either view, the selection in the other view should update.

Users shall be able to select features in either the table display or within the map display and the selection in the complement element (table or map) should update.

Reference:

G3.1, G3.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.23 Report Attributes

Purpose:

Ensure attributes of features that are selected can be reported.

Requirement/Description:

The system shall provide tools to report the attributes of selected features.

Users shall be able to either select a feature in the map view and then open the attribute table for the layer to examine the feature attributes or use standard identify functionality to examine a selected feature's attributes.

Reference:

G2.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

CARTOGRAPHY

R1.24 Map Output

Purpose:

Ensure map products can be created in the system.

Requirement/Description:

The system shall support the production of map output containing an integrated view of both vector and image data.

Reference:

G2.3

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.25 Symbology and Rendering

Purpose:

Ensure features can be represented in various ways on the basis of their various attributes to create more meaningful map presentations.

Requirement/Description:

The system shall provide tools to generate maps with varying cartographic displays based on the attributes of features and/or the attributes of those objects that share defined relationships with the features.

Reference:

G3.5

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.26 Save and Share Maps

Purpose:

Ensure maps can be saved in a number of formats for later use by different individuals.

Requirement/Description:

The system shall provide the ability to save maps in formats listed below. It shall be possible to reopen and modify saved documents. It shall be possible to share saved maps among users who have the same data access and permissions.

- MXD
- EPS
- PDF
- BMP
- JPG
- TIF
- AI
- EMF
- CGM

These maps are either "smart" maps (.mxds) or static output (the remaining formats). Users that desire to edit a static output format map must access the saved GIS data from which it was generated and make updates to the cartographic product and then resave the map in the desired format.

Reference:

G3.5

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.27 Templates

Purpose:

Ensure a standardized representation of spatial data can be designed for reuse in creating consistent map output.

Requirement/Description:

The system shall provide a framework for defining and saving map templates. The system shall provide tools to manage the application and reuse of the map templates to generate specific map presentation products.

Reference:

G3.5

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.28 Insert Maps in Report

Purpose:

Ensure maps can be integrated in report output.

Requirement/Description:

It shall be possible to embed maps within standard ArcMap layouts. These maps shall be "live" in that changes to the existing map are reflected in the map within the layout.

Reference:

G3.5

Comment:

'Report' here is interpreted here to mean ArcGIS Layouts. For more information on this functionality, reference the ArcGIS documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

TEXT

General Comments:

A label is text on a map that provides map readers with additional information about a feature. ArcMap can label features on the fly with any of their attributes (or with text from several fields) and has advanced options for label placement and visibility. Labels can be made into annotation layers and then stored in geodatabases

When more precise control over label placement is required, dynamic labels can be converted to annotation. Converting labels to annotation allows the user to manually control the labeling of features. The conversion process creates text graphics from the dynamic labels and displays them on the map. The user can work with each label, or text graphic, independently—move it, change

its size or font, and change the text. For example, the user might want to move a few labels to make room for one that ArcMap was unable to place due to space constraints. ArcMap also provides the user with a list of all the labels that weren't placed and lets you interactively place them on your map as needed.

While annotation is typically text, it can also be any graphic element that annotates the map—such as lines, circles, and polygons.

Like other feature classes in the geodatabase, all features in an annotation class have a geographic location and attributes, and can either be inside a feature dataset or a standalone annotation class. Each annotation feature has its own symbology including font, color, and so on.

There are two kinds of annotation in the geodatabase: feature-linked annotation and nonfeature-linked annotation. Nonfeature-linked annotation is geographically placed text strings that are not associated with features in the geodatabase. An example of nonfeature-linked annotation is the text on a map for a mountain range. No specific feature represents the mountain range, but it is an area the user would want to mark.

Feature-linked annotation is associated with a specific feature in another feature class in the geodatabase. The text in feature-linked annotation reflects the value of a field or fields from the feature to which it is linked. The annotation feature class is the destination class in this composite relationship, while the feature class it is annotating is the origin class. This means the origin feature controls the location and lifetime of the annotation.

As with other composite relationships, the origin feature controls the destination feature. Therefore, when the origin feature is moved or rotated, the linked annotation moves or rotates with it. When the origin feature is deleted from the database, its linked annotation feature is also deleted. If the value of a field from which the annotation text is derived changes in the feature, the annotation feature has special behaviors to respond to those changes and automatically update its text string.

R1.29 Non-feature Linked Annotation

Purpose:

Ensure annotation that is not related to specific features can be displayed in the map view.

Requirement/Description:

The system must support non-feature-linked annotation.

Reference:

G1.8

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.30 Automatic Annotation Placement

Purpose:

Ensure the system can automatically place annotation in the map view.

Requirement/Description:

The system must support automatic annotation placement. Automatic placement shall include placement at regular intervals along a feature and scale-based placement and shall avoid annotation placement conflicts.

Reference:

G1.8, G2.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.31 User-defined Annotation Placement

Purpose:

Ensure users can define the placement of annotation in the map view.

Requirement/Description:

The system must support automatic and user-defined annotation placement. Automatic placement shall include placement at regular intervals along a feature and scale-based placement. A common tool shall facilitate annotation generation and management of annotation properties, including text font characteristics and orientation.

Reference:

G1.8, G2.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.32 Annotation Creation

Purpose:

Ensure there is integrated access to create the various varieties of annotation available within the system.

Requirement/Description:

A common tool set shall facilitate annotation generation for automatic and user-defined annotation. The tools shall facilitate management of annotation properties, including text font characteristics and orientation. The tools shall facilitate addition and deletion of annotation.

Reference:

G1.8, G2.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.33 Feature Dimensioning

Purpose:

Ensure the system supports the inclusion of feature dimensions in the map view.

Requirement/Description:

The system shall provide tools to dimension portions of a feature based on a linked feature attribute.

This is provided by ESRI COTS functionality. For more information reference the ArcGIS documentation or the comments regarding text above.

Reference:

G1.8, G2.2

Comment:

Currently there are no specific examples of dimensioning needs in BLM/FS processes. Unless otherwise noted during the SRS review, it is assumed that the COTS dimensioning will meet the BLM requirements.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

AREA OF INTEREST

R1.34 Create and Navigate AOI's

Purpose:

Provide tools for users to create and use area of interest (AOI) polygons for navigating and filtering information.

Requirement/Description:

The system should allow users to navigate the map display by selecting a previously defined and named AOI. Several predefined AOIs (township, county, state) should be delivered with the system and should be defined on the basis of the extents of system basemap features.

Users will be able to select a particular AOI from a list of predefined AOIs by name and the map view extents will be reset to the extents of the selected AOI. Users can then use standard ESRI COTS map navigation functionality to further manipulate the map view.

Reference:

Verbal clarification (BLM Meeting, ESRI Redlands 3/14-15, 2002)

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

QUERY

R1.35 AOI Filtering

Purpose:

Ensure the system can limit the results of a query on the basis of an AOI.

Requirement/Description:

The system should support the filtering of all queries on the basis of AOI polygons. If an AOI is being used, all selection sets returned by spatial and attribute queries should only contain those features or objects that meet the query criteria and are within the AOI polygon. No features or objects that satisfy the query criteria but which are outside of the AOI polygon should be selected in the map or tables. This should be the default behavior for queries when an AOI has been used for map navigation, but users should be able to deactivate AOI filtering if desired.

The default behavior when using an AOI should be that the selection set returned by a spatial or attribute query executed by the user is further filtered by a further spatial query that filters the selection set by the extents of the AOI. Essentially this is simply a spatial query run in conjunction with an attribute query or a spatial query run in conjunction with another spatial query. ('Select from the currently selected features in *feature layer of interest* that are contained by *the AOI polygon*'). An AOI is 'in use' anytime a user has used an AOI to navigate the map view. However, users should be able to turn the automatic AOI filtering off if desired, in which case the selection set returned would include all loaded features satisfying the criteria specified in the query.

Reference:

G2.4, Verbal clarification (BLM Meeting, ESRI Redlands 3/14-15, 2002)

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.36 Query Tool

Purpose:

Ensure a tool set exists to generate data queries.

Requirement/Description:

The system shall provide tools to generate ad-hoc spatial and attribute queries. The system should provide the ability to refine selection sets by adding or subtracting items to and from

selection sets on the basis of additional queries. The system shall provide the ability to return attribute information about selected features.

Reference:

G3.2

Implementation:
This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.37 Save Queries

Purpose:

Ensure it is possible to save queries for reuse.

Requirement/Description:

The system should provide for the saving and reuse of queries against specific datasets

Reference:

G3.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.38 Attribute Queries

Purpose:

Ensure data can be queried on the basis of its attributes.

Requirement/Description:

The system should provide the ability to define attribute queries. Attribute queries will be simple logical queries.

Reference:

G3.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.39 Spatial Queries

Purpose:

Ensure spatial data can be analyzed on the basis of its spatial relationships with other features.

Requirement/Description:

The system should provide the ability to define spatial queries between and among spatial features.

Reference:

G3.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

Data Management General Capabilities

Purpose:

Ensure data can be managed in the system so it can be made available and useful.

General Requirement:

The system should provide for the management of data within the system.

DATA LOADING IMPORT AND EXPORT

R1.40 Data Mapping

Purpose:

Ensure data fields and their respective data that is being migrated from an existing system to the new database is loaded into the proper table.

Requirement/Description:

The system should provide tools to assist the user in mapping existing data fields to feature and object classes within the system schema to automate data migration from the preexisting database to the new database schema.

Reference:

G5.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.41 Validate Input

Purpose:

Ensure that once data has been migrated, it can be validated to identify basic problems that may have occurred during the migration or that were unidentified in the previous system.

Requirement/Description:

The system should support basic validation of migrated data. The system should insure that the number of records migrated matches the original number of records to insure no data is lost. The system should provide quality control tools to insure that the migrated data is in compliance with the domains, ranges, and relationships specified in the data model. The system should provide tools to validate the polygon feature topology of migrated data.

Reference:

G5.1, Meeting with BLM Staff ESRI Redlands 5/23-24.

Implementation:

Validation rules will be defined as part of the data management plan. These rules for data constraints, domain values, and relationships and will be set up using the COTS functionality in ArcGIS. The reponsibility for implementing (defining) validation rules will be administered at the enterprise level. Customization will be required to provide tools for batch validation of domains, ranges, and relationships following data migration.

The requirement to validate polygon topology will be met by customization of COTS functionality. See ArcGIS documentation for further information.

R1.42 NILS Conversion Tools

Purpose:

Ensure the functionality required to load data into the new database is available.

Requirement/Description:

The system should provide a suite of tools to assist the user in migrating from an existing database to the system database.

The specifics of these tools will be specified at a later time as the required functionality is largely dependent on the data model and a more detailed investigation of existing data structures. The list of current data sources from which migration will be required is limited to SFF, GCDB/LSI, and LR2000.

Reference:

G5.1

Comment:

For further detail, reference the import/export requirements for the SM/MM system.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.43 Data Subsets

Purpose:

Ensure that subsets of the database can be created and used.

Requirement/Description:

The system should support exporting subsets of datasets. The system should provide the ability to define queries to identify the desired features for inclusion in the subsets.

Reference:

G1.20, G4.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.44 Staged Migration

Purpose:

Ensure that the database migration can take place over a number of staged phases that the current databases and their distribution dictate.

Requirement/Description:

The system should support staged migration of existing databases to the NILS database schema. It should not be required for users to perform the entire conversion in one batch migration process, rather users should be able to migrate different features, tables, and attributes at their discretion as long as it is not inconsistent with the logic of the database schema prior to versioning.

Reference:

G5.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.45 Common Format Support

Purpose:

Ensure a number of data formats can be viewed within, or imported or exported to the system.

Requirement/Description:

The system should support the loading of the following spatial data file formats.

- ESRI file formats: ArcView shapefiles, Geodatabase, Coverages, ArcSDE layers, ArcIMS services
- CAD: DXF, DWG, DGN
- Rasters: GRID, SDE rasters, ERDAS RAW, ERDAS Imagine, ESRI Band, Bitmap, CADRG, DTED, ER Mapper, GIF, ADRG, JPG, NIFT, TIFF, MrSid, Sun Raster
- Vectors: ADS, DFAD, DIME, DLG, ETAK, GIRAS, IGDS, IGES, MOSS, SDTS, SLF, TIGER, AGF, MIF
- Survey files: ASCII, GSI, TPS
- Other: OLE DB tables, text files

Reference:

G5.1

Comment:

A list of formats supported by the ESRI COTS application is provided above. For a complete list of supported formats, reference the ArcGIS documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.46 Digitization

Purpose:

Ensure data can be entered into the database for use in the system by means of digitization.

Requirement/Description:

The system should support data input from manual digitization of a hardcopy map or plat map from a digitization tablet.

Reference:

G5.6

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.47 Scanning and Vectorization

Purpose:

Ensure data can be entered into the database for use in the system by means of scanning and vectorization.

Requirement/Description:

The system should support the use of scanned hardcopy photos, maps, and plats for use as raster images. The system should support the subsequent vectorization of these or other images through heads-up digitization, vector feature extraction from rasters, or raster to vector conversion.

Reference:

G5.7

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.48 Manual Data Entry

Purpose:

Ensure data point coordinates can be entered for use as point features in the system.

Requirement/Description:

The system should support manual data entry of coordinate data and subsequent generation of point features from the entered coordinates.

Reference:

G5.8

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.49 Import Tables

Purpose:

Ensure RDBMS tables can be migrated to the database for use in the system.

Requirement/Description:

The system should provide tools to migrate purely tabular data from non-spatial RDBMS into the database as Object classes. The following databases shall be supported:

Oracle

Informix

SQL Server

Microsoft Access

IBM DB2

Reference:

G5.9

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.50 Generate Intersection Tables

Purpose:

Ensure that tables to support relationships among entities in the database can be generated.

Requirement/Description:

The system should generate intersection tables and supporting relationships.

The system will support and manage many-to-many relationships between feature and object classes.

Reference:

G5.9

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.51 Validate Tables

Purpose:

Ensure that tables to support relationships among entities in the database can be validated.

Requirement/Description:

The system should support the validation of key values and intersection tables for loaded data.

The system should support and enforce the referential integrity of database relationships, i.e. cardinality.

Reference:

G5.9

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

DATA MANAGEMENT

R1.52 Integrated Access

Purpose:

Ensure distributed data can be accessed and integrated within the system.

Requirement/Description:

The system should support integrated access to centralized, localized, and remotely distributed data storage architectures.

Reference:

G1.19

Comment:

For more detail about how various distributed data sources and architectures are accessed simultaneously, reference the ArcGIS ArcCatalog documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.53 Manage Architecture

Purpose:

Ensure the data architecture and distribution can be managed.

Requirement/Description:

The system should provide tools to deploy and manage complex data storage architectures where data is accessed from local and network file systems, internet services, and RDBMS.

Reference:

G1.19

Comment:

For further information on the deployment and management of complex data architectures as relevant to ArcGIS, reference the ArcCatalog and ArcSDE documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.54 Manage Datasets

Purpose:

Ensure datasets can be managed.

Requirement/Description:

The system should provide tools to find and manage datasets and files.

Reference:

G4.1

Comment:

For further information on this functionality, reference the ArcGIS ArcCatalog documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.55 Manage Data Properties

Purpose:

Ensure the properties of data can be managed.

Requirement/Description:

The system should provide tools to allow users with the appropriate permissions to modify the schema of a dataset or the dataset's logical elements, including the dataset attribute definitions, domains, relationships, and schema.

It should be possible to modify the properties of a feature class. The system should provide the ability to modify the construction and validation rules for a feature class and its relationships.

Reference:

G4.2, G4.3

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

DATA GENERATION

R1.56 Curve Support

Purpose:

Ensure curves can be used to create vector data in the system.

Requirement/Description:

The system should support the construction of parametric and non-parametric curves for vector data.

When creating features, it is often necessary to create a parametric curve. ArcMap offers two ways to create a segment that is a parametric curve. You can use the Arc tool to create a parametric curve or, you can use the Tangent Curve command on the Sketch tool context menu to add a parametric curve to an existing segment. When you create a tangent curve, you must specify two parameters for the curve from the following options: arc length, chord, radius, or delta angle. You must also specify whether you want to create the curve to the right of the line or to the left of the line, according to the direction in which the line was drawn. The curve is created from the last vertex of the existing segment based on the parameters you defined.

Reference:

G1.7

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

DATA MANIPULATION

R1.57 Projection Conversion

Purpose:

Ensure datasets can be converted between standard supported projections.

Requirement/Description:

The system should provide coordinate conversion utilities to transform between dataset coordinate systems.

Reference:

G4.4

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.58 Format Conversion

Purpose:

Ensure datasets can be exported to a number of data formats.

Requirement/Description:

The system should provide conversion utilities to export datasets into a number of formats.

Reference:

G4.4

Comment:

See R1.45. For a complete list of the export formats supported by the ESRI COTS application, reference the ArcGIS documentation.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

DATA EDITING

R1.59 Edit Attributes

Purpose:

Ensure feature and object attributes can be edited.

Requirement/Description:

The system should provide tools to edit feature and object attributes. Rights to edit specific datasets are determined on the basis of a user's User Group and related task permissions.

Reference:

G2.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

TOPOLOGY

R1.60 Topology Tools

Purpose:

Ensure a tool set is available to manage topology.

Requirement/Description:

The system should provide topology tools to manage associations within and between two-dimensional (area) features, zero-dimensional (point) features, and one-dimensional (line) features. The system should provide support for parametric curves within a topology.

Reference:

G1.10

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.61 Topology Rules

Purpose:

Ensure topology rules can be defined for spatial data within the system.

Requirement/Description:

The system should provide for the management of topology rules on the basis of business rules. The user should be able to control where and how coincidence and adjustments do or do not occur between features participating in a topological relationship.

The rules implemented will comply with the specifications of the Data Management Plan. For further detail on the specifics of the topology rules, reference the DMP.

Reference:

G1.10

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

VERSIONING

Through ArcGIS versioning capabilities, users can edit the same GIS features concurrently. This is referred to as optimistic locking. At release 1 of Survey Analyst, survey datasets are not versioned using the Geodatabase versioning functionality. Survey features are edited using a pessimistic locking approach based on survey projects. This prevents more than one user from updating a single feature while it is in use by another editor (i.e. while the survey project is locked).

Within an edit session a user should be able to undo edits up to the last "save" transaction. Within a version hierarchy, a user should be able to delete a version without posting to the "default" or "permanent" database. Within the RDBMS, an administrator can back up and rollback the database to an archived state.

R1.62 Multiple Editors

Purpose:

Ensure several editors can edit the same data simultaneously.

Requirement/Description:

The system should support multiple simultaneous user editors.

Reference:

G4.6

Comment:

As noted above, GIS features are edited simultaneously using versioning mechanisms, while survey feature edits are managed using survey project locking.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.63 Transaction Model

Purpose:

Ensure the system supports long transactions.

Requirement/Description:

The system should provide a database transactional model to support long transactions for editing.

Comment:

As noted above, GIS features are edited simultaneously using versioning mechanisms, This allows for long transactions. Survey feature edits are managed using survey project locking.

Reference:

G1.17, G4.6

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.64 Track Changes and Rollback

Purpose:

Ensure that there are opportunities to undo changes to datasets before making the edits permanent.

Requirement/Description:

The system should manage optimistic feature tracking and should track changes in the new version. The system should support rollback and commit points during editing.

Within an edit session a user should be able to undo edits up to the last "save" transaction. Within a version hierarchy, a user should be able to delete a version without posting to the "default" or "permanent" database. Within the RDBMS, an administrator can back up and rollback the database to an archived state.

Reference:

G4.6

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.65 Resolve Conflicts

Purpose:

Ensure that conflicts between versions of a database can be resolved before the final changes are made in the default database.

Requirement/Description:

The system should support conflict resolution between user versions when versions are posted to the database. The system should provide tools to compare versions and assist the user in reconciling the differences between versions and the default database. The system should also assist with tracking and correcting errors.

Comment:

As noted above, GIS features are edited simultaneously using versioning mechanisms, This allows for conflict detection and resolution. Survey feature edits are managed using survey project locking, this will prevent conflicts and is thus not applicable to survey features.

Reference:

G4.6, G4.8

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

Workflow General Capabilities

WORKFLOW GENERAL

R1.66 Guide Processes

Purpose:

Ensure work is completed in a logical and standardized manner and that users are assisted in completing the proper tasks in the correct manner.

Requirement/Description:

The system should provide tools to guide and track business transactions from their inception through the necessary process tasks to their final completion. As a task is completed, the system should provide the ability to mark the task as complete.

A user's day-to-day tasks should be captured and integrated into structured Job process workflow definitions. The majority of a user's responsibilities are then encapsulated within a Job and are completed in the context of a Job within the system. This allows for a clearer relationship among the tasks that must be completed to finish a Job and facilitates easier tracking of the status of the various Jobs that are underway at any one time. Furthermore, tasks become part of a coherent integrated process instead of scattered and disjointed pieces of work. Subsequently, users can more easily manage Jobs that they are responsible for and less time is spent between Jobs because of the overhead incurred in context switching.

The system should provide an interface that clearly illustrates an instantiated version of a specific Job. Users should be able to step through the tasks in the Job's process that they are responsible for to accomplish a Job. As a task is completed users should be able to mark the task as complete and see this reflected in the interface. Optionally, the system can notify the party responsible for the next task that the Job has been assigned to them or can notify others that the Task has been completed

Reference:

G6.0

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.67 View Jobs by Responsibility

Purpose:

Ensure users can determine what Jobs their Group is responsible for and locate Jobs in the system.

Requirement/Description:

The system should provide users the ability to view the status of all open Jobs that are either assigned to them as an individual or that their User Group(s) is responsible for. The system should allow users to search for Jobs on the basis of the Job's number or other attributes of the Job.

Users should be able to see all of the active Jobs in the system whose current Task in the Job's process flow is one for which the user's Group is responsible for completing.

By default User's should only see instantiated Jobs that are at a process Task that needs to be completed by users with the responsibilities and associated permissions of their Group. By default if a Job task has been assigned to a specific user in their Group, the job should not be presented to them. In other words, user's should be able to search for all Jobs assigned to any particular User Group or User, but the only Jobs initially shown to them by default will be those for which they are directly responsible or those for which their Group(s) is responsible and have not yet been assigned to a specific individual user.

If a user is a member of multiple Groups, active Jobs that are at tasks in the process their Groups are responsible for should be organized and presented to the user by Group.

When a user begins to work on a task that has not been assigned to a specific Group member, the system should transfer responsibility to them. If there are subsequent tasks in the process that their Group is also responsible for, the system should assign responsibility for those tasks to the user as well.

Reference:

G6.2, Meeting with BLM staff, ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.68 View Jobs by ID

Purpose:

Ensure users can locate Jobs within the system.

Requirement/Description:

The system should allow users to search for Jobs on the basis of the Job's number. The search should include both open and completed or cancelled Jobs.

Jobs should be assigned a unique ID when they are initiated. Users will also be able to assign more meaningful textual information to a Job as well.

Reference:

G6.2, Meeting with BLM staff, ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.69 Task Completion

Purpose:

Ensure the completion of tasks and jobs can be tracked.

Requirement/Description:

The system should require that all tasks in each job must be completed before a job is marked as complete. In some cases there it will not be necessary to do anything to complete the task for a particular instance of a job. In these instances, the step should be marked as complete and the process can continue. The system should not permit subsequent tasks to be marked as complete until all previous tasks are marked complete.

Users should be able to mark a task as complete. A Job for which all constituent process tasks are completed should automatically be marked as complete and should no longer be open in the system.

For further details reference requirement R1.67 (View Jobs by Responsibility).

Reference:

G6.1, Meeting with BLM staff, ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.70 Workflow Deviation

Purpose:

Ensure workflows are fixed and cannot be altered once they are published.

Requirement/Description:

The system should not permit any alteration or customization of workflow processes by users once the Job processes are defined. When additional steps are necessary to complete a specific instance of a defined job, the system should allow the user to add notes about the necessary additional tasks at the task where the process branches. No further integration or system support for deviations from defined workflows is required.

Users cannot add or remove steps from Job processes. When a task is not relevant to the specific Job at hand, a member of the responsible Group can mark the task as complete and proceed with the subsequent tasks. If a specific Job requires additional work to complete the system should allow users to make a detailed note about what else was required at any point in the process,

typically where the process branches. These notes should persist with the Job as part of the audit task logs. For further information on task logs reference requirement R1.77 (Task Logs)

Comments:

Administrators can create and manage jobs to add new functionality to the system.

Reference:

Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.71 Integrate with COTS Software

Purpose:

Ensure the workflow management is integrated with COTS software functionality.

Requirement/Description:

The system should integrate workflow management with ESRI COTS functionality. The system should allow for specification of both manual and custom or automated tasks to be carried out within the GIS application and users should be able to initiate these tasks from tasks within the job process.

Users will step through Job processes within a standardized interface. When a task is completed in the GIS system, the user should be able to start the GIS application from the interface. On starting the GIS system, the application should be initialized with the appropriate template for the task. The relevant tools, functionality, and process needed to complete the GIS task should be available to the user.

High-level tasks and sub-tasks, and all "placeholder" tasks should be accessible from within a Microsoft Internet Explorer web browser. When a GIS task consists of one or more levels of subtasks (that are to be completed in the GIS), the user should be able to enter the task from the IE interface and then step through the Job process tasks within the GIS application with a customized and integrated tool in the ArcMap interface. For more information on navigating GIS tasks, reference the Integrate with Create Workflows requirement.

Where appropriate, when a user begins a GIS task, the GIS application interface, tools, and map presented to the user should reflect the information and tools necessary to complete the task.

Reference:

G6.5.1, G6.5.2, Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

WORKFLOW CREATION

R1.72 Create Workflows

Purpose:

Ensure that administrative tools for creating and managing process workflows are available.

Requirement/Description:

The system should provide an interface for defining Job process workflows by centralized administrators.

These workflows may contain "placeholder" tasks for non-GIS tasks, such as offline or manual tasks, or tasks carried out in 3rd party applications. At release 1.1 the tasks do not need to be integrated with any 3rd party applications. The system should support a nested hierarchy of tasks so that tasks can be defined by the sum of their sub-tasks.

The process may also include GIS tasks and related task assistant tools to guide the user through the set of GIS steps. GIS sub-tasks in the task assistant should not be mandatory and can represent optional tasks, either/or tasks, or simply notes of advice to accomplish the GIS task in the task assistant. For more information on navigating GIS tasks, reference the Integrate with Core Software requirement.

Administrators should be able to assign responsible User Groups for each process task and for GIS tasks, and associate custom tools and map templates relevant to the task as part of the definition of the processes.

Users should be able to initiate and complete workflows as either complete Jobs or as a series of Jobs that must be accomplished. The granularity of the defined Jobs will be determined later as they depend in large part on the implemented functionality and a greater understanding of the respective process flows.

Reference:

Meeting with BLM staff ESRI-Redlands 3/14-15.

Comment:

ESRI will develop an initial set of Jobs for the BLM to integrate Release 1.1 and COTS functionality within the context of Job process workflows. The Jobs to be included in Release 1.1 will be mutually agreed upon prior to beginning the development phase.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

WORKFLOW MANAGEMENT

R1.73 Assign Responsible Parties

Purpose:

Ensure tasks can be allocated to specific users to assign accountability and manage resource allocation.

Requirement/Description:

The system should provide a job management framework to assign and transfer job responsibility on the basis of the current task in the job process. The system should automatically pass responsibility to the manager of the User Group responsible for the subsequent task when a task is completed if no other group member is assigned. The system should allow the User Group manager to assign responsibility for the task to an individual member of the responsible User Group. The system should allow for subsequent reassignment of responsibility to alternate Group member by a manager with the appropriate permissions.

Users with the appropriate permissions should be able to assign responsibility for tasks to any member of the User Group that is responsible for the task. When the responsibility for a job transfers from one Group to another (because a Group completes a task and a different Group is responsible for the subsequent step) the task will not be assigned to a particular member of the Group, but only to the Group in general. At that point either a member of the responsible Group can begin working on the Job task and they become the assigned responsible party or the administrator for the Group (most likely the manager) can assign it to a Group member. The administrator for the Group should be the only individual who has the ability to transfer responsibility for a task from one Group member to another once the task has been assigned. For further detail, reference requirement R1.67 (View Jobs by Responsibility).

Reference:

G6.3, Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.74 Integrate Manual System and Non-system Tasks

Purpose:

Ensure various tasks not directly related to new GIS functionality are represented in the workflow process and integrated with other automated system tasks so that the Job process is a

cohesive representation of a Job and not a disjointed series of GIS tasks with no relation to non-GIS tasks that are inherent to the Job.

Requirement/Description:

The system should integrate manual, system and non-system (third-party application) tasks within job processes and allow for tracking of both types of tasks. Manual and non-system tasks do not have to be initiated from the process, but defined processes should integrate placeholder steps for these tasks. These steps should be marked complete as any other steps and must be allocated to a responsible party the same as system tasks.

For further detail, reference requirement R1.70 (Workflow Deviation).

Reference:

G6.5.4, Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.75 Initiate and Cancel Jobs

Purpose:

Ensure Jobs can be opened and cancelled.

Requirement/Description:

The system should allow for the initiation and cancellation of jobs by users with the appropriate permissions. In the case of cancelled jobs, the system must allow for a rollback of all changes made to data during completion of the cancelled job's tasks.

Jobs will normally need to be initiated as the result of a paper transaction or simply in the course of daily work. Users will have the ability to select to initiate a Job at any time. Jobs should only be initiated by users who are members of the User Group responsible for the first task in the Job process flow. Any member of the User Group responsible for the first step in a given Job should be able to initiate a Job, but users who are not members of that Group should not be able to initiate the Job.

A Job should be given an ID when it is initiated. These must not be recycled. These IDs can be used to track Jobs and find Job task logs.

Once initiated, a Job may be cancelled at any point in its process. The administrator for the User Group responsible for the task at which the Job currently is in its process should be the only individual with the ability to cancel a Job. Tasks within a Job can be re-done so that an error that is discovered can be corrected before the job is completed. Tasks subsequent to the erroneous task would also need to be re-done. The log would reflect that the task was re-done along with any comments the user made about the Task

Reference:

G6.3

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.76 Discrete Access

Purpose:

Ensure users only have access to functionality and data that they are responsible for as it relates to the tasks of their User Group.

Requirement/Description:

Provide tools to manage access to discrete levels of application functions as they relate to tasks, and the database tables and features on the basis of the User Groups.

Users will only be able to complete tasks that they are responsible for. Users can only be responsible for tasks for which their User Group is responsible.

Data access permissions should be synchronized with task access to insure that users responsible for a particular task can carry it out. For example, users completing an edit task must have write permission to the dataset in question.

Reference:

G4.5, G6.3

Precursor:

R1.3 (Enforce User Groups), R1.67 (View Jobs)

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

AUDITING

R1.77 Task Logs

Purpose:

Ensure that it is possible to determine who completed specific Job tasks and when.

Requirement/Description:

The system should provide a framework for logging task completion. The log should list the task name, user, and time the task was completed. For edit tasks, the log should also include the dataset name of the target dataset edited during the task. It is not necessary to track the specific modifications to database objects or features. Users should be able to view task logs in support of Job auditing.

Logs should be automatically generated and should list the user the Task was originally assigned to, the user that actually completed the Task, the date and time the Task was completed, and any user comments about the Task. Users should have the ability to view logs both for on-going

Jobs and for Jobs that have been completed. The system should not allow for deletion of the logs except for that functionality which is readily available to system database administrators for the deletion records.

Users should be able to search logs by:

- Job number
- User name of the user who completed the task
- Date the task was completed
- Search string in the task log comments
- Some combination of the above

As a result of performing a search of the task logs, the system will present the user with the individual log entries for each Task identified. The user should be able to select from this list of Task log entries to see the log of entries for the Job. For example, the system should allow a user to search the task logs for all the Tasks they completed the previous day. The system would return the individual log entries for that user for the previous days date. The user could then select from those logs and in turn be presented with the entire task log for the discrete Task's respective Job.

All users should have the ability to search the task logs.

Reference:

G4.7, Meeting with BLM staff ESRI-Redlands 3/14-15 and 5/23-24.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

R1.78 Administrative Reports

Purpose:

Ensure the status of Jobs within the system can be monitored and viewed in standardized report formats.

Requirement/Description:

The system should provide tools to run and view standardized reports showing the status of Jobs and tasks within the system.

Users with the appropriate permissions should be able to run and view a number of reports. The reports should be defined as a limited number of standardized templates. The templates delivered with the release by ESRI will provide a list of active and closed Jobs by:

- Region (Township, County, State, Administrative State)

- Current Assigned User Group
- Current Assigned User

The system should provide the ability to run administrative reports of Jobs listing all Jobs assigned on the basis of the query results for the templates shown above.

The system should allow for centralized publication of additional templates by an Administrator for use by other users from the application. The templates will be available to all users.

The system will not provide the mechanism for defining the report templates, but simply must allow report templates created by a central system administrator to be made available to other users from within the system.

Reference:

G6.3, Meeting with BLM staff ESRI-Redlands 3/14-15 and 5/23-24.

Implementation:

This requirement will be met by the enhancement and extension of functionality previously developed for other application projects by ESRI.

Survey Project Structure and Utilities

SURVEY PROJECT

R1.79 Create survey project

Purpose:

Provide tools to define a new survey or modify a survey project and input the required properties, save to the specified data set.

Requirement/Description:
Surveyor shall assist the user in creating a survey project that will include the following items:

Item	Description
Name	Project name
Creator	Name of the surveyor
Date created	Date that the project was created
Description	Project description
Unit of measure	Measurement data shall be able to be displayed in its native units. But not necessarily. Units to be supported for distance: chains/ links, rods/links. Units to be supported for direction: Degrees - Decimal Minutes Units to be supported for elevation: US Survey Feet, Meters
Default error estimates	Should support individual error estimates on measurements
Datum	Should display current Datum, including measurements
Vertical Datum	Should display current Vertical Datum, including measurements
UTM ZONE	Should display current UTM zone
State Plane Zone	Should display current State Plane Zone
Project Elevation	Support for elevations at a project level
Survey 1-n	The survey project may consist of multiple

	surveys
Links to reference data	Links to plats/field notes

The user can open and modify an existing survey project, or create a new survey project.

Reference:

S3.6, SM1.02

Comments:

The system should assist user creating and naming projects in a manner consistent with NILS enterprise implementation methodology. This will help minimize confusion in the management of the national database. Naming conventions and standards will be defined in coordination with the BLM that covers the East, PLSS, Texas, Hawaii.

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

SURVEY RESEARCH TOOLS

Purpose: Locate, view and evaluate all relevant digital database and non-digital records for the research scope. Sources may include hardcopy records, plats, monument rubbings, aerial photos, survey notes, etc.

General requirement: The surveyor needs tools to search through various records repositories to find the legal descriptions, ordinances, and other jurisdictional documents that affect the land status of the survey area.

R1.80 Search resources

Purpose:

To find and research materials and documents that may be necessary for a particular survey

Requirement/Description:

Surveyor shall be able to search the following reference resources:

Reference	**Access methodology**
GIS Reference Layers	GeoCommunicator or LAN/WAN Search
Reference Documents	GeoCommunicator if published, or internet
Digital Survey Plats	GeoCommunicator or LAN/WAN Search

The user needs to define search parameters. Reference sources may include all available paths (local data, WAN/LAN data, internet data). The user may be able to browse available data and information (may have to download data files first) and save those that are within the research scope.

Search Criteria
location (defined spatially)
date (date range)
format and storage location (digital, file, etc.)
Time

Note: These types of research are only possible if indexes and catalogs of related information and data are accessible.

Reference:

S3.2, S3.4, SM1.01, GC 01

Comment:

Searches on non-GIS data will be performed outside of the GIS.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.81 Modify search parameter

Purpose:

To modify search parameters to refine search.

Requirement/Description:

Surveyor shall have the ability to specify/modify/refine search criteria

Search Criteria
location (defined spatially)
date (date range)
format and storage location (digital, file, etc.)

Time

Provide an interactive dialog(s) where the search parameter form and the search results are available so the user can modify the search parameters, select and remove unnecessary results, etc. to refine the results. User may look at source metadata or actually view the source (if accessible) and evaluate its usefulness.

Reference:

S3.3, S3.4, 3.5, SM1.01

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

IMPORT SURVEY PROJECT DATA

R1.82 Import standard file format (SFF)

Purpose:

Import standard file format (SFF) WinGMM data files

Requirement/Description:

The system should support the import of WinGMM data for use in the measurement network. The following files will be imported:

- CON
- RAW
- SID
- DEF
- LX
- AN

The BLM's legacy survey data exists in WinGMM format that needs to be imported into the survey dataset. It has been determined that these 6 files contain all the necessary data that needs to be brought forward into SM/MM.

See the SFF White Paper (Appendix C) for more information.

Reference:

MM 3.01

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.83 Manual data entry

Purpose:

To manually enter survey information into Survey Analyst

Requirement/Description:

The user may select from a set of measurement data types and perform manual data entry.

Examples of information that could be entered are documented in the Geodetic Calculations Requirements Specification.

Reference:

M4.1

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.84 Import from collection devices

Purpose:

To import data to Survey Analyst from a defined format file.

Requirement/Description:

The system should import the following file formats:

- GSI (measurements and points)
- TPS (measurements and points)
- Trimble (measurements and points)

Reference:

S2.2

Comment:

File format requirements need to be confirmed during review.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.85 Import non-measurement management control data

Purpose:

To import control data from sources outside of the SM/MM data model.

Requirement/Description:

The system should support the import of non-measurement management control data for use by measurement management.

"Non-measurement management control data" includes data from cooperators and other providers. The ASCII importer tool in Survey Analyst will provide the capability to import survey control points (x, y lat/long).

Reference:

MM 3.02

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.86 Validate import

Purpose:

To validate data during import to avoid incorrect data transfer.

Requirement/Description:

The system should run data validation on an imported data set. If there is an error, the user can edit the data and re-import the file. System will generate conversion reports and update the graphical display as appropriate.

Reference:

M4.2, MM 2.01 – MM2.08.07

Comment:

During the import of SFF, the files will only be imported to the extent they meet the defined format. Files not meeting these defined formats will be rejected.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

EXPORT SURVEY PROJECT DATA

R1.87 Export standard file format (SFF)

Purpose:

Export data to WinGMM SFF.

Requirement/Description:

The system should support the export of survey data for use with WinGMM. The following files will be exported by the export utility:

- CON
- RAW
- SID
- DEF
- LX
- AN

These six files are the minimum required to use the WinGMM software. Exporting to these file formats will allow for continued use of existing WinGMM software, which will aid in the transition and support of NILS.

See the SFF White Paper (Appendix C) for more information.

Reference:

MM 3.07

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.88 Export survey data for use in a data collector

Purpose:

To export measurement data to a file format that can be imported into a device (data collector) and/or databases outside of the SM/MM database.

Requirement/Description:

System must assist the user in creating an export file of a subset of the measurement data. This export file can then be imported into a data collector.

At release 1, the application shall support export of coordinates and measurement data in the following formats:

- ASCII (points only)
- GSI
- Trimble
- TPS

Reference:

S2.1 – S2.3

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.89 Export data for publication database

Purpose:

Make a version of the survey data available for publication and distribution.

Requirement/Description:

System must assist the user in making a version of approved survey data available for distribution on the Land Survey Information website.

See LSI data model.

Reference:

Meeting with BLM staff ESRI-Redlands 3/14-15.

Comment:

The file format for the survey data exported to the publication database needs to be mutually agreed upon during phase 2 of the LSI implementation.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

MAP MEASUREMENTS AND FEATURES

R1.90 Display measurements

Purpose:

Graphically display measurements.

Requirement/Description:

The system must support update of the display to show the spatial extent and selected measurements (symbolized to indicate status, reliability, etc.).

The system should support display of current measurement data set including measurements, survey points and reference features.

Reference:

M3.1, MM3.03, M 2.01

Comment:

The display of measurements requires Survey Analyst.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.91 Update graphic display

Purpose:

To update the display after an adjustment is completed.

Requirement/Description:

The system should support the update of the graphic display.

After an adjustment, the display should be updated to show updated survey features.

Reference:

S7.1, (partly MM 1.01 – MM2.08.7)

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.92 Display Measurements and their computations/parameters

Requirement/Description:

The system should graphically display measurement data and allow the user to view the parameters that make up the measurement.

Measurements are displayed graphically, and the user has the ability to see all the parameters/computations that make up the measurement.

Reference:

MM3.04

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.93 Display Survey Points

Requirement/Description:

The system should graphically display point data and allow the user to view the parameters that make up the survey point.

Reference:

MM 3.03

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.94 Edit Survey Points

Requirement/Description:

The system should allow the user to edit a survey point and the parameters for that point.

Reference:

MM 3.03

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

MANAGING PROJECTIONS

Purpose:

To manage data in different projections and provide tools for re-projecting data.

R1.95 Define projection parameters for survey data sets and survey data

Purpose:

Define and provide information of a given projection and datum for a survey data set.

Requirement/Description:

For each projection in the survey data set the system should define the following projection parameters:

- Coordinate system
    - Geographic
        - Projection
        - Datum
        - Ellipsoid/Spheroid
            - Semimajor axis
            - Semiminor axis
            - Inverse flattening
        - Angular unit
        - Prime meridian

- Projected
  - Projection
  - Parameters
    - False easting
    - False northing
    - Central meridian
    - Scale factor
    - Latitude of origin
  - Linear unit

In a survey dataset, survey data may stem from different sources, each with different projections. To work with the data, all survey data should be projected into one projection system.

Reference:

S4.2

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.96 Manage survey data set with different projections

Purpose:

To manage and combine survey data with different projections.

Requirement/Description:

The system should support the ability to take vector and raster data from different source datum/projections and display them together in a single spatial user interface.

Supported datum/projections are:

- State Plane
- UTM
- Geographic

For further listings see ArcMap documentation.

Reference:

MM1.02, MM3.03, M3.05, S4.2, SM1.02, SM2.01

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

TRANSFORMATION

Purpose:

Transform measurements into common datum and unit type.

R1.97 Support transformation between projections

Purpose:

To support the transformation between projections and coordinate systems.

Requirement/Description:

System should provide transformation tools between state plane coordinates and geodetic coordinates. The system should provide on the fly transformations in the map view so data in different projections can be viewed simultaneously within one reference system and the system should also provide utilities to reproject datasets from one coordinate system to another.

Reference:

M3.1, M3.2, MM 2.01 – MM2.08.7, G4.4

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

GEOREFERENCE

R1.98 Support geo-referencing

Purpose:

Georeference raster data to use as reference layer.

Requirement/Description:

The system should provide tools to geo-reference images, transform data, or clip data and save as a new image.

Raster data is commonly obtained by scanning maps or collecting aerial photographs and satellite images. Scanned maps don't usually contain information as to where the area represented on the map fits on the surface of the earth; the locational information delivered with aerial photos and satellite imagery is often inadequate to perform analysis or display in proper alignment with other data. Thus, in order to use these types of raster data in conjunction with other spatial data, often need to align—or georeference—it to a map coordinate system.

Reference:

S4.2, SM 2.01

Implementation:
This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

Legal Description Fabric

LEGAL DESCRIPTION FABRIC DATA MODEL

Purpose:

A legal description fabric data model is required for maintaining the legal descriptions of the parcels as well as the geometries of the parcels. The legal description fabric is also necessary to maintain the relationship between the survey fabric and the parcel fabric.

Requirement/Description:

The data model must include entities that store the basic legal description components - geometry and attributes (text, ID, source ID, etc.).

Reference:

P 1.8 P 1.9, P 1.10, PM-03

R1.99 Create Legal Description Fabric

Purpose:

To create a feature class representation of the survey fabric, showing the geometries for the legal descriptions.

Requirement/Description:

Process to create the basic legal description components - geometry and attributes (text, ID, source ID, etc.).

This is a collection of legal description geometry areas, represented either as standard features or as Survey Features. All polygons representing legally-described areas have been formed from the measurement network and other boundaries to support the parcel fabric.

Reference:

P 1.8 P 1.9, P 1.10, P 3.0, PM-02

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.100 Create topology rules for Legal Description fabric

Purpose:

To define the rules for how features share coincident geometry and how those features should behave and be edited.

Requirement/Description:

The business requirements for topology will be defined in the Data Management Plan referenced in section 2.1

Once defined, the topology rules can be implemented in ESRI's ArcCatalog technology.

Reference:

Data Prep Process. Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.101 Analyze topology of Legal Description Fabric

Purpose:

To analyze the legal description fabric for any discrepancies against the topology rules.

Requirement/Description:

The system shall provide tools for analyzing the topology and identifying errors.

Topology rules may include non-overlapping polygons for townships, no gaps between townships

Reference:

Data Prep process. Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.102 Report and Correct Topology Errors

Purpose:

To report any topology rule violations so that they can be fixed in the LD fabric or survey network. Also, to provide tools that step the user through a process for correcting errors in topology.

Requirement/Description:

The system should provide a tool for reporting topology errors. The errors will be rectified through the use of COTS topology tools (reference R1.60) and task assistants that guide the user in the correction process.

Reference:

Data Prep process. Meeting with BLM staff ESRI-Redlands 3/14-15.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.103 Update Legal Description Fabric geometries

Purpose:

Process for adjusting the coordinates of an existing feature fabric (e.g., legal description fabric, parcel fabric) to enhance (cartographic) alignment with a reference source that has desired control features (which may include map control).

Requirement/Description:

The system must provide tools for editing (creating, updating) the legal description fabric. This includes inserting new legal description components and/or editing existing components. This may include fitting, assembling, and resolving legal description components within the legal description fabric. This also includes linking the vertices of the LD fabric to the points in the survey fabric and updating to the LD fabric with changes from adjustments to the survey fabric.

Reference:

P 5.0, P 5.1, P 5.2, P 5.3, P 5.4

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

Least Squares Adjustment General Capabilities

LEAST SQUARE ADJUSTMENT

Purpose:

To perform an iterative parametric least squares adjustment on a measurement network to analyze and adjust coordinate values for points and generate statistics on measurement and coordinate reliability.

A measurement data set of control point coordinates, bearings, angles and distances is analyzed utilizing error estimates and the initial set of approximate coordinates is adjusted to achieve the most likely coordinate values possible for the data set and create statistical reports and other LSA output, including error ellipses.

R1.104 Adjustment repository – LSA Meta information

Purpose:

To provide general Meta information about the least square adjustment performed on one or more survey projects.

Requirement/Description:

The system shall store the adjusted coordinates in a data repository along with data Meta information.

The Meta information in general describes the 'history' of the performed LSA through a set of descriptors.

- Name of adjustment
- Date
- Settings (general error estimate settings)
- Type of adjustments
- Person
- Setup points
- Measurements
- Control points (Reference points)
- Quality descriptors

Reference:

M1.10, M3.0, M3.4, MM 2.07

Comment:

This is supported by the COTS Survey Analyst.

Implementation:

This requirement will be met by COTS functionality.

LSA QUALITY ASSURANCE

Purpose:

To provide different sets of estimates of the quality of the least square adjustment e.g. statistical reports of residual errors.

R1.105 Calculate reliability values

Purpose:

Compute reliability values expressed as error ellipses for all adjusted coordinates in the LSA data set.

Requirement/Description:

The system shall be able to compute calculations of reliability values identified as error ellipses, expressing a minimum of ninety five percent reliability for all adjusted coordinates in the data set.

The LSA shall compute a radius (semi-major axis) of maximum error (SU), radius (semi-minor axis) of minimum error (SV), and the angle from north (positive clockwise) of the direction of maximum error (T).

Reference:

M1.12, MM 2.08.1

Comment:

Currently the ESRI COTS software generates a covariance matrix and calculates error ellipses with 97.5% reliability during the LSA.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.106 Create tabular reports

Purpose:

To identify blunders in data by displaying adjustment data in a tabular format.

Requirement/Description:
The system shall display in a tabular form sorted or unsorted results for each adjusted element.

The following parameters should be displayed in tabular format:

-

Reference:

M3.5, MM 2.08.2

Comment:

- For version 1 the ESRI COTS functionality will support some statistical tabular reporting using the GUI of the LSA in Survey Analyst.

Implementation:

This requirement will be met by COTS functionality.

LSA ADJUSTMENT TYPES

R1.107 Unconstrained adjustment

Purpose:

To perform a parametric least square adjustment using only one point as the basis of the coordinate system ("unconstrained").

Requirement/Description:

System shall support unconstrained adjustment. The user should be able to toggle this feature on or off.

Reference:

MM2.08.5

Implementation:

This requirement will be met by COTS functionality.

SET LSA PARAMETERS

Purpose:

To manage necessary functions to prepare input data for least squares adjustment.

Requirement/Description:

Manage necessary functions to prepare input data for least squares adjustment, including utility tools for conversion and transformations.

Comment:

Requirements in this category is also covered by requirements under import data, manage projections and transformation.

R1.108 Support specification of adjustment parameters

Purpose:

The purpose is to support the selection and specification of parameters to perform least square adjustment.

Requirement/Description:

System shall assist user in specifying the adjustment parameters using a data entry tool accessible prior to successive least square adjustment sessions that allows the user to set, calculate or adjust the following adjustment parameters:

- Including or excluding measurement data
- Known corrections for the survey project
- Error estimates
- Adjustment type
- Set adjustment name

Reference:

M1.11, M3.1, MM 2.01 – MM2.08.7

Comment:

This requirement represents the workflow of the preparations to perform a least square adjustment.

Implementation:

This requirement will be met by COTS functionality.

R1.109 Update measurement data

Purpose:

To make updates to the measurement data during the least square adjustment process.

Requirement/Description:

The system shall be able to support an edit session of the measurement data during the data analysis and LSA adjustment process.

The user specifies measurement data set and measurement data to be edited. Measurement data may be edited while the user is in between iterations of analyzing and adjusting a measurement network.

Reference:

M4.2, (partly MM2.01-MM2.08.7), MM1.12, MM3.04, MM3.05, MM3.06

Comment:

The original requirement focused on the use of spreadsheet technologies to perform the edit session – this will not be implemented. This requirement will be met with the editing model in Survey Analyst.

Implementation:

This requirement will be met by COTS functionality.

R1.110 Manage weighting

This requirement was dropped as a result of further analysis and mutual agreement between ESRI and the BLM as a result of meetings held at ESRI-Redlands during May, 2002.

R1.111 Define weights

This requirement was dropped as a result of further analysis and mutual agreement between ESRI and the BLM as a result of meetings held at ESRI-Redlands during May, 2002.

R1.112 Modify adjustment limits with residual tolerance

This requirement was dropped as a result of further analysis and mutual agreement between ESRI and the BLM as a result of meetings held at ESRI-Redlands during May, 2002.

R1.113 Modify adjustment limits with iteration limits

This requirement was dropped as a result of further analysis and mutual agreement between ESRI and the BLM as a result of meetings held at ESRI-Redlands during May, 2002.

R1.114 Apply known corrections

Purpose:

To apply a correction to coordinates and/or measurements.

Requirement:

The system shall be able to apply known corrections to measurements and/or coordinates.

Reference:

M3.2, MM 2.01 – MM2.08.7

Implementation:

This requirement will be met by COTS functionality.

R1.115 Quick coordinate generation

Purpose:

To generate a set of provisional coordinates as input for the least square adjustment

Requirement/Description:

The system should support the generation of provisional coordinates from a survey data set.

Reference:

M3.2, MM 2.01 – MM2.08.7

Implementation:

This requirement will be met by COTS functionality.

R1.116 Edit error estimates

Purpose:

To perform an edit session of the error estimates on survey projects.

Requirement/Description:

The system should provide tools to edit error estimates for a selected survey project.

Reference:

M3.2, M4.2, MM 2.01 – MM2.08.7

Comment:

The ESRI COTS functionality currently supports editing of error estimates on survey project level. Editing individual error estimates will be supported in a later release.

Implementation:

This requirement will be met by COTS functionality.

R1.117 Run preliminary adjustment

This requirement was dropped as a result of further analysis and mutual agreement between ESRI and the BLM as a result of meetings held at ESRI-Redlands during May, 2002.

R1.118 Feature to feature control

Purpose:

To control the adjustment of selected features in the least square adjustment data set.

Requirement/Description:

The system must support feature instance level control during the update process. i.e. a user may hold fixed some points, while adjusting other points.

Reference:

M3.4

Implementation:

This requirement will be met by COTS functionality.

R1.119 Select set of measurements

Purpose:

To select a set of measurements for participating in the least square adjustment workflow.

Requirement/Description:

The user shall, for each setup station, be able to select a subset of measurements on which to perform further processing.

The processing could involve performing LSA on a subset of measurements.

Reference:

M1.5, M3.1, (partly MM 2.01 – MM2.08.7), "Select extent for LSA"

Implementation:

This requirement will be met by COTS functionality.

R1.120 Select extent for LSA

Purpose:

To define the spatial extent of the least square adjustment process.

Requirement/Description:

The system shall provide tools to select a set of setup stations to participate in the LSA.

Reference:

M1.9, M3.1, (partly MM 2.01 – MM2.08.07)

Comment:

The ESRI COTS functionality supports this requirement.

Implementation:

New development may be required to meet this requirement.

R1.121 Set adjustment names

Purpose:

To give a name to each individual least square adjustment.

Requirement/Description:

System shall support creation and persistence of unique names for each set of adjustment parameters.

Reference:

M3.1

Implementation:

This requirement will be met by the configuration of COTS functionality.

R1.122 Display names of least square adjustments

Purpose:

To give the user ability to select a specific adjustment.

Requirement/Description:
The system shall support the display and selection of available adjustments.

Reference:

M3.1

Implementation:

This requirement will be met by COTS functionality.

MAP ADJUSTMENT DATA

Purpose:

Review the results of the adjustment and determine the necessary modifications required to improve the adjustment solution.

R1.123 Display LSA anomalies

Purpose:

To display least square adjustment anomalies on a map.

Requirement/Description*:*

System must be able to map anomaly reports based on error ellipses (reliability display).

Reference:

M3.5, M3.6, (partly MM 2.01 – MM2.08.7)

Comment:

Direction snoop and distance snoop will be supported in a later release.

Implementation:

This requirement will be met by COTS functionality.

R1.124 Display unadjusted measurement data

Purpose:

To spatially display measurement data in its unadjusted state.

Requirement/Description:

The system should support graphic display of the unadjusted measurement data.

Reference:

M3.3, MM 2.02

Implementation:

This requirement will be met by COTS functionality.

R1.125 Plot unadjusted control positions

Purpose:

To identify and locate unadjusted control points.

Requirement/Description:

The system should plot control points in their unadjusted position.

With this display a user can ascertain where wrong measurement values exist and where wrong point identifiers were chosen.

Reference:

M3.3, MM 2.02

Comment:

The ESRI COTS functionality supports separate reference points during the least square adjustment. If the control points in this requirement are regarded as any other point entering the least square adjustment then the ESRI COTS functionality further will support this requirement.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.126 Display specific unadjusted data area

Purpose:

To ensure that unadjusted measurement and control data can be displayed for a defined area.

Requirement/Description:

The system should display all data in a user-specified area, with measurement lines assembled end-on-end in their unadjusted geometry and control points plotted in their unadjusted position.

Reference:

M3.3, MM 2.02

Comment:

ESRI COTS functionality supports this requirement. The difference between this requirement and the display of unadjusted measurements and control points is the capability to view a user-defined area.

Implementation:

This requirement will be met by COTS functionality.

R1.127 Display control point identifiers

Purpose:

To display the control point identifiers in a map display.

Requirement/Description:

The system should display control point identifiers (labeled and/or colored) such that they can be discerned from the line endpoints labeled with their Point ID during data entry.

Reference:

M3.3

Comment:

ESRI COTS functionality supports this requirement by displaying symbolized and/or annotated features (Survey reference points).

Implementation:

This requirement will be met by COTS functionality.

COGO Computation Capabilities

Purpose:

This is the toolbox that provides coordinate geometry (COGO) calculation methods and procedures. NILS users may access COGO tools during a variety of the following operations:

- Corner restoration
- Section and minor subdivision
- Perform layout
- To search for point locations
- Building a measurement network,
- Support legal description fabric
- Parcel fabric.

The COGO procedures involve calculations, computations and construction methods, which are essential tools components in the Field-to-Fabric common data model. Surveyors perform computations in the field as they attempt to locate and calculate coordinates for physical features such as monuments, buildings, and watercourses. COGO computations are used during the construction of measured features within a measurement network. Parcel editors use these calculations and procedures to build legal description geometry.

CALCULATE COORDINATE POSITIONS

Purpose:

Process to use coordinate geometry tools to determine coordinate positions from planar calculations.

Comment:

The ESRI COTS functionality in Survey Analyst currently supports planar calculations but does not support geodetic calculations in the COGO constructions. Geodetic calculations will be supported in a later release.

R1.128 Determine midpoint position

Purpose:

To determine the midpoint position between two coordinate positions.

Requirement/Description:
Surveyor shall determine midpoint positions based on the following geometric features:

- Points

- Lines
- Arcs

Reference:

S2.4, S7.1

Implementation:

This requirement will be met by the configuration of COTS functionality.

R1.129 Point calculation by direction distance

Purpose:

Calculate coordinate values of a new point based on the direction and distance.

Requirement/Description:

The system should support the calculation of coordinate values of a new point based on the direction and distance from an existing point(s) and connect new point(s) with line feature(s) where necessary. The system should attribute the new point with a point identifier and method of computation (direction-distance).

Coordinates are calculated for a new point and all necessary line features are created.

Reference:

MM 1.01, S7.1

Comment:

For planar projections, ESRI COTS functionality supports the calculation of new point coordinates and assignment of point ID's

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

R1.130 Point calculation by proportion

Purpose:

Calculate coordinate values of a new point based on a proportion applied to the direction and distance between two existing points..

Requirement/Description:

The system should support the calculation of coordinate values of a new point based on the direction, distance, and a proportionate (record measurement versus new measurement) distance along a line between two points and connect the new point with line feature(s) where necessary.

The system should attribute the new point with a point identifier and method of computation (proportion).

Coordinates are calculated for a new point and all necessary line features are created.

Reference:

MM 1.02, S7.1

Comment:

For planar projections ESRI COTS functionality supports the calculation of new point coordinates and assignment of point ID's.

Implementation:

This requirement will be met by the configuration of COTS functionality

R1.131 Point calculation by intersection of lines

Purpose:

Calculate coordinate values of a new point based on the intersection of two lines.

Requirement/Description:

The system should support the calculation of coordinate values of a new point based on the intersection of two lines and connect new point with line feature(s) where necessary. The system should attribute the new point with a point identifier and method of computation (intersection of lines).

Coordinates are calculated for a new point and all necessary line features are created.

Reference:

MM 1.03, S7.1

Comment:

For planar projections ESRI COTS functionality supports the calculation of new point coordinates and assignment of point ID's.

Implementation:

This requirement will be met by the configuration of COTS functionality.

R1.132 Point calculation by fixed distance

Purpose:

Calculate coordinate values of new point(s) based on a fixed distance toward another point.

Requirement/Description:

The system should support the calculation of coordinates of new point(s) based on a fixed distance toward any existing point and connect new point(s) with line feature(s) where necessary. The system should attribute the new point with a point identifier and method of computation (fixed distance).

Coordinates are calculated for new point(s) and all necessary line features are created.

Reference:

MM 1.04, S7.1

Comment:

For planar projections ESRI COTS functionality supports the calculation of new point coordinates and assignment of point ID's.

Implementation:

This requirement will be met by the configuration of COTS functionality.

R1.133 Calculate intersection by bearing/bearing

Purpose:

Calculate coordinate values of new point(s) based on intersections of two or more bearings from existing points.

Requirement/Description:

The system should support the calculation of coordinate values of new point(s) based on intersections of two or more user specified bearings and connect the new point(s) with line feature(s) where necessary. The system should attribute the new point with a point identifier and method of computation (bearing-bearing).

Reference:

S7.1

Comment:

For planar projections ESRI COTS functionality supports the calculation of new point coordinates and assignment of point ID's.

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

CALCULATE TRAVERSE

R1.134 Generate provisional coordinates

Purpose:

Provide best provisional coordinate values for all line endpoints in the data set in preparation for the least squares process.

Requirement/Description:

System should generate provisional coordinates for all traverse points (with necessary reductions if state plane zone is selected).

Coordinate values are generated that most closely approximate the value that will be generated by the least squares process.

Reference:

M3.2, MM 2.06

Implementation:

This requirement will be met by COTS functionality.

R1.135 Compass adjustment

Purpose:

Is to perform a compass adjustment of a traverse.

Requirement/Description:

The system should support adjustments performed through compass rule adjustment (broken boundary adjustment).

Reference:

S7.1, S2.4, MM 1.13, MM2.06

Implementation:

This requirement will be met by COTS functionality.

R1.136 Transit adjustment

Purpose:

To perform a transit adjustment of a traverse.

Requirement/Description:

The system should support adjustments performed through transit rule adjustment (grant boundary adjustment).

Reference:

MM 1.13, MM2.06

Implementation:

This requirement will be met by COTS functionality.

R.137 Irregular boundary adjustment

This requirement was dropped as a result of further analysis and mutual agreement between ESRI and the BLM during meetings held at ESRI-Redlands during May, 2002.

R1.138 Calculate and display traverse misclosure

Purpose:

Calculate numeric misclosure data for a closed traverse.

Requirement/Description:

The system should support the calculation of numeric misclosure data for each traverse and display each result with the traverse.

- Error comparison value
- Distances, written as text
- Cardinal equivalents, written as text

Reference:

M3.6, S7.0, S7.1, MM 2.03, MM 2.06

Implementation:

This requirement will be met by COTS functionality.

R1.143 Store information on COGO calculation method for each point

Purpose:

To create the ability to regenerate or repeat the COGO construction for any point.

Requirement/Description:
The system shall for each COGO constructed point store information of the method and parameters used in such a way that the point can be generated by the same method using the same or updated parameters.

Reference:

S2.4, S7.1

Comment:

Implementation:

This requirement will be met by the configuration of COTS functionality.

MAP SURVEY TYPE PLAT

R1.139 Assist in mapping survey type plats

Requirement/Description:

The system should provide tools and map templates to assist the user in creating digital survey plat cartographic product. The system should allow for maps to be saved in soft copy or plotted to a supported device.

Reference:

Comment:

BLM needs to provide sample maps and work with ESRI to design a new digital survey plat representation of the current map products. The published Alaska Survey Platting guidelines will be used as a starting point for the development of a survey plat template.

Implementation:

This requirement will be met by the configuration of COTS functionality. See ArcGIS documentation for further information.

R1.140 Archive Map Products to PDF

Requirement/Description:

The system should provide tools for saving map products in PDF format for archiving purposes.

Reference:

March 14-15 meeting in Redlands

Comment:

The naming convention and storage location of the PDF files need to be defined by BLM during the design process.

Implementation:

This requirement will be met by COTS functionality. See the ArcGIS documentation for further information.

LEGAL DESCRIPTIONS

R1.141 Identify legal descriptions on survey plats

Purpose:

To provide a legal description for a plat.

Requirement/Description:

The system should provide users with a visual aid in identifying legal area description types by labeling polygons.

The system should provide a labeling capability that will indicate through text the aliquot and/or nominal description for a given polygon. I.e. the label for the southwest quarter would be "SW".

Reference:

MM 4.03

Comment:

BLM needs to further refine this requirement during the design process.

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

R1.142 Point ID numbering scheme

Purpose:

Requirement/Description:

The system should insure the numbering of point ID's is unique by following a numbering scheme and avoiding duplication of IDs[1].

This numbering scheme should comply with the system specified in the Point ID white paper (to be added as Appendix C in a forthcoming draft)

Reference:

M4.1, S7.2, MM 2.01

Implementation:

This requirement will be met by the development of new custom extensions to ArcGIS.

[1] The GCDB data and BLM structure in general supports multiple points with the same ID for monuments

Appendix B: Summary of Requirements

	Requirement	COTS		Custom	
		COTS	COTS config	New work	App extension
	Security				
	Users				
1.1	Multi-user environment	x			
1.2	Administer permissions				x
1.3	Enforce user groups		x		
	Database design				
	Data				
1.4	Manage data content		x		
1.5	Persist source data and precision		x		
1.6	Model feature state			x	
1.7	Model inactive parcels			x	
1.8	Integrate Data Formats	x			
	Relationships				
1.9	Maintain database relationships	x			
1.10	Support specific database relationships		x		
1.11	Manage geometries in fabrics		x		
	Model				
1.12	Comply with FGDC CDCS		x		
1.13	Published data model			x	
1.14	Partial data models	x			
1.15	Data model customization	x			
	Documentation				
1.16	Sample data			x	
1.17	Database implementation guide			x	
	Metadata				
1.18	Record feature metadata			x	

	Requirement	COTS		Custom	
		COTS	COTS config	New work	App extension
	Map Display General Capabilities				
	Map interaction				
1.19	Display and navigate	x			
1.20	Select features	x			
1.21	Display AOIs			x	
1.22	Integrate table and map views	x			
1.23	Report attributes	x			
	Cartography				
1.24	Map output	x			
1.25	Symbology and rendering	x			
1.26	Save and store maps	x			
1.27	Template	x			
1.28	Insert maps in reports	x			
	Text				
1.29	Non-feature linked annotation	x			
1.30	Automatic annotation placement	x			
1.31	User defined annotation placement	x			
1.32	Annotation creation	x			
1.33	Feature dimensioning	x			
	Area of interest				
1.34	Create and Navigate AOI's			x	
	Query				
1.35	AOI filtering			x	
1.36	Query tool	x			
1.37	Save queries	x			
1.38	Attribute queries	x			
1.39	Spatial queries	x			
	Data Management				
	Data loading import and export				
1.40	Data mapping	x			
1.41	Validate input		x		
		COTS		Custom	

	Requirement	COTS	COTS config	New work	App extension
1.42	Conversion tools				
1.43	Data subsets	x			
1.44	Staged migration	x			
1.45	Common format support	x			
1.46	Digitization	x			
1.47	Scanning and vectorization	x			
1.48	Manual data entry	x			
1.49	Import tables	x			
1.50	Generate intersection tables		x		
1.51	Validate tables				
	Data management				
1.52	Integrated access	x			
1.53	Manage architecture	x			
1.54	Manage datasets	x			
1.55	Manage data properties	x			
	Data generation				
1.56	Curve support	x			
	Data manipulation				
1.57	Projection conversion	x			
1.58	Format conversion	x			
	Data editing				
1.59	Edit attributes	x			
	Topology				
1.60	Topology tools	x			
1.61	Topology rules		x		
	Versioning				
1.62	Multiple editors	x			
1.63	Transaction model	x			
1.64	Track changes and rollback	x			
1.65	Resolve conflicts	x			
	Workflow				
		COTS		**Custom**	

	Requirement	COTS	COTS config	New work	App extension
	General				
1.66	Guide processes				x
1.67	View jobs by responsibility				x
1.68	View jobs by id				x
1.69	Task completion				x
1.70	Workflow deviation				x
1.71	Integrate with COTS software				x
	Create workflows				
1.72	Create workflows				x
	Workflow management				
1.73	Assign responsible parties				x
1.74	Integrate manual and non-system tasks				x
1.75	Initiate and cancel jobs				x
1.76	Discrete access				x
	Auditing				
1.77	Task logs				x
1.78	Administrative reports				x
	Survey project structure and utilities				
	Survey project				
1.79	Create survey project		x		
	Survey research tools				
1.80	Search resources	x			
1.81	Modify search parameter	x			
	Import survey project data				
1.82	Import SFF			x	
1.83	Manual data entry	x			
1.84	Import from collection devices			x	
1.85	Import non-measurement management control data			x	
1.86	Validate import			x	
	Export survey project data				
		COTS		**Custom**	

	Requirement	COTS	COTS config	New work	App extension
1.87	Export SFF			x	
1.88	Export survey data for use in data collector		x		
1.89	Export data for publication database			x	
	Map measurements and features				
1.90	Display measurements	x			
1.91	Upgrade graphic display	x			
1.92	Display measurements and their computations/parameters	x			
1.93	Display survey points	x			
1.94	Edit survey points	x			
	Managing projections				
1.95	Define projection parameters for survey data sets and survey data	x			
1.96	Manage survey data set with different projects	x			
	Transformations				
1.97	Support transformation between projections	x			
	Geo-reference				
1.98	Support geo-referencing	x			
	Legal description fabric				
	Legal description fabric data model				
1.99	Create legal description fabric			x	
1.100	Create topology rules for LDF		x		
1.101	Analyze topology of LDF	x			
1.102	Report topology errors	x			
1.103	Update LDF geometries		x		
	Least square adjustments				
	Least square adjustments				
1.104	Adjust repository - LSA meta information	x			
	LSA quality assurance				
		COTS		**Custom**	

	Requirement	COTS	COTS config	New work	App extension
1.105	Calculate reliability values			x	
1.106	Create tabular reports	x			
	LSA adjustment types				
1.107	Unconstrained adjustment	x			
	Set LSA parameters				
1.108	Support specification of adjustment parameters	x			
1.109	Update measurement data	x			
1.110	Manage weighting	x			
1.111	Define weights	x			
1.112	Modify adjustment limits with residual tolerance			x	
1.113	Modify adjustment limits with iteration limits			x	
1.114	Apply known corrections	x			
1.115	Quick coordinate generation	x			
1.116	Edit error estimates	x			
1.117	Run preliminary adjustment	x			
1.118	Feature to control feature			?	
1.119	Select set of measurements			?	
1.120	Select extent for LSA			?	
1.121	Set adjustment names		x		
1.122	Display names of LSA			?	
	Map adjustment data				
1.123	Display LSA anomalies	x			
1.124	Display unadjusted measurement data	x			
1.125	Plot unadjusted control positions	x			
1.126	Display specific unadjusted data area	x			
1.127	Display control point identifier	x			
	COGO computations				
	Calculate coordinate positions				
1.128	Determine midpoint position		x		
		COTS		**Custom**	

	Requirement	COTS	COTS config	New work	App extension
1.129	Point calculation by direction distance	x			
1.130	Point calculation by proportion		x		
1.131	Point calculation by intersection of lines		x		
1.132	Point calculation by fixed distance		x		
1.133	Calculate intersection by bearing/bearing		x		
	Calculate traverse				
1.134	Generate approximate coordinates	x			
1.135	Compass adjustment	x			
1.136	Transit adjustment	x			
1.137	Irregular boundary adjustment	x			
1.138	Calculate and display traverse misclosure			?	
	Survey map output				
	Map survey plat type				
1.139	Assist in mapping survey type plats		x		
1.140	Create PDF archive	x			
	Legal descriptions				
1.141	Identify legal descriptions on survey plats			x	
1.142	Point id numbering scheme			x	

Appendix C: Standard File Format Description

.CON file						
L#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	**SA Gap**
1-n	N/A	N/A			Header info	
n+1 - m	strPointID	Point ID	2	6	IASPoint.Name (Assigned During Import)	
	dblLatitude	Latitude in DDMMSS.SSSS	9	14	IASPoint.Easting (Assigned During Import)	
	dblLongitude	Longitude in DDMMSS.SSSS	24	12	IASPoint.Northing (Assigned During Import	
	dblElevation	Elevation in feet	37	8	IASPoint.Height (Assigned During Import	
	intEstNorthingError	Estimated northing error in whole feet	46	3	Some are set to 0 – if 0 we may need to read the value from the .avl file DM to verify Avail (AVL) file usage 4/4/02	
	IntEstEastingError	Estimated easting error in whole feet	50	4	Some are set to 0 – if 0 we may need to read the value from the .avl file DM to verify Avail (AVL) file usage 4/4/02	
	IntNorthAmericanDatum	North American Datum (27 or 83)	55	3	ISpatialReference (Survey Project) (Create with New Survey Project)	

Notes/questions:

1. The first record of the 27/83 record pairs is the native unit. The other is calculated from the base (ex: 83 is calculated from 27)
2. The “source” (date,agency,datum,sourceID, etc..) are not currently tracked in a standard strategy by BLM – there is no current location to track this meta data per control point (not computed point) within SA. Need further definition of the required meta data from BLM.
3. Merge control points would have a “source” ID of “special”

.DEF file						
L#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	**SA Gap**
2	strStatePlaneZone	state plane zone	NA	NA	ISpatialReference(Survey Project)	
3	intDatum	NAD 27 or 83	NA	NA	ISpatialReference(Survey Project)	
4	intUnits	ft=2, meters=1, Int. ft=3	NA	NA	ISpatialReference(Survey Project)	
5	dblDefaultElevation	Default elevation	NA	NA	IsurveyExtensionPointPackage (Set when creating Project)	
9	dblDefAngleErrEst	default for angle error estimate	NA	NA	IStdDevPolarMeasurement (Set when creating Project)	
10	dblDefBearingErrEst	default for bearing error estimate	NA	NA	IStdDevPolarMeasurement (Set when creating Project)	
11	dblDefControlNErrEst	default for control N error estimate	NA	NA		
12	dblDefControlEErrEst	default for control E error estimate	NA	NA		
21	strProjectName	project name, ex: T05NR14W	NA	NA	Survey project name	
22	intMeridian	meridian, ex: 14	NA	NA	ISpatialReference	
23	strState	state, ex: AZ	NA	NA	ISpatialReference	
24	intUTMZone	utm zone number, ex: 12	NA	NA	ISpatialReference	

Notes/questions:

1. AZ central is state plane zone NAD27 = feet, NAD83 = feet or meters… used to determine spatial reference

1.

.RAW file						
L#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	**SA Gap**
1-n	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
	N/A	N/A	NA	NA	Header info	
n+1	999999	Start of survey plat data	NA	NA	N/A	
n+2 - m	strBegPTID	Point ID for beginning of line	1	6		
	strEndPTID	Point ID for end of line	10	6		
	dblDistanceInChainUnits	Distance in chain units	17	8	IPolarMeasurement (Import Process)	
	intQuadrantOfBearing	Quadrant of the bearing 1=NE, 2=SE	26	2	IPolarMeasurement	
	dblValueOfBearing	Value of the bearing	29	10	IPolarMeasurement	
	strSurveyIdNumber	Survey identifier number	40	7	?	

m+1	999998	End of survey plat data	NA	NA	N/A	

Notes/questions:

1. There will be only one 999999-999998 block in a single .RAW file.

.SID file						
L#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	**SA Gap**
	"S"	Record type				
	strSIDIdentifier	SID number must start in column +2	2	17		
	dblDistErrEst	Distance error estimate (units=ft)	20	7	IStdDevPolarMeasurement	
	dblDistErrEstPPM	Distance error estimate PPM (no units)	27	8	IstdDevPolarMeasurement	
	dblBearingErrEst	Bearing error estimate (units=seconds)	35	8		
The "S" record will optionally be followed by one or more "C" records in the following format:						
	"C"	Optionally additional "C" records can follow the first "C" record after the "S" record				
	StrType	Type of record: DT, DC, BT, BC, DU				

	StrValue	DT values are: • G=ground • E=ellipsoid, • P=Plane/Grid DC values are: • Constant correction (-1 feet/meters) • PPM BT values in column 6: • M=mean • F=forward • G=grid • C=compass/magnetic • L=local/assumed BT values in column 7 are: • A =convert bearings to angles (must be followed by an error estimate for the angles as DD.MMSS) • Or blank Ex: BT:GA 0.0530 BC values are: • DD.MMSS pos=clockwise,neg=counterclockwise Ex: BC:–2.1040 DU values are: • DU:F <distance units are ft.> • DU:C <chains> • DU:M <meters>			

	ADD 4 pages				

Notes/questions:

1. "C" records preceding the first "S" record will be skipped
2. Entries enclosed in <> are skipped (they are comments)

.LX file						
L#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	
1-2	N/A				Header info	
The following describes the attributes per record for records 3-n						
F#	**Element**	**Description**			**Planned usage within SA / Comment**	**SA Gap**
1	Point ID	Point identifier	2	6	LSA data	
2	Lat	Latitude (adjusted)	9	11	LSA data	
3	Long	Longitude (adjusted)	21	12	LSA data	
4	Elevation	DM to determine usage	34	8		
5	Northing Reliability Indicator	Distance from pt to error ellipse intersect	43	3	OC -- To be used by tool to display the error ellipse Note: if there is an .adj file, this value is not imported. If adj is present import these values: 1. Error SU 2. Ellipse SV 3. Info T. And place them into the appropriate SA table	

6	Easting Reliability Indicator	Distance from pt to error ellipse intersect	47	4	OC -- To be used by tool to display the error ellipse Note: if there is an .adj file, this value is not imported	
7	Line sequence number	Obsolete	52	2	OC	
8	Line type	Obsolete	55	1	OC	
9	Pin command		57	1	OC	
10	X-UTM		59	10	Not imported	
11	Y-UTM		70	11	Not imported	
	999999				Indicates end of section (will have multiple sections: S-N, E-W, Optionally Special	

Notes/questions:

1. OC = place into object class for later usage by the project
2. Section sequence is always S-N PLSS, E-W PLSS, Special Surveys non-cardinal (optional), Point (optional)
3. There can be one or more of these, and duplicates.
4. Need to remove duplicate points for LSA
5. We need all points in all sections for line data. This is used to generate polygons.

.AN file						
F#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	**SA Gap**
1	strSEC		1	4	Not imported	
2	intSecNo		5	3		
3	strSecDupCD		8	1	Can be 'A' or 'B'	
4	StrNominalLocation		9	1	Can be A-Q, Z	
5	T_		11	2	Not imported	
6	strSurveyType		13	1	Can be: A-U, W-Z, 2	
7	strSurveyNumber		19	5	May be blank	
8	strSurveySuffix		20	2	May be blank	
9	N_		23	2	Not imported	
10	strSurveyNote		25	1	May be blank	
11	dblAcreage		27	9		
12	;		36	1	Not imported	
13	M		38	1	Not imported	
14	StrPrinMerCD		39	2	Can be: 1-37, 39,40,41,43-48,91	
15	T		41	1	Not imported	
16	StrTierNo		42	3		
17	StrTierFrac_DupCD		45	1	Format: 000XY	

					Where: • 000 = whole tier/range number, right justified with Leading 0's • X= 1,2,3,0,A,B • Y=N,S,E,W	
18	StrTierDirCD		46	1		
19	R		47	1	Not imported	
20	IntRangeNo		48	3		
21	StrRangeFrac_DupCD		51	1	Format: 000XY Where: • 000 = whole tier/range number, right justified with Leading 0's • X= 1,2,3,0,A,B • Y=N,S,E,W	
22	StrRangeDirCD		52	1		
23	DblLat		54	11		
24	DblLong		66	12		

Notes/questions:

1. This data is to be imported into an object class – contains polygon centroid with associated anno

.ADJ file						
L#	**Element**	**Description**	**Start**	**Length**	**Planned usage within SA / Comment**	**SA Gap**

Appendix C

DEF file codes for determining the target survey dataset.

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ÉÍÍÍÍÍÍÍÍ Continental U.S. Mercator Zones ÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 ° 1 ALABAMA EAST    ³ 17 IDAHO CENTRAL    ³ 33 NEVADA EAST         °
 ° 2 ALABAMA WEST    ³ 18 IDAHO WEST       ³ 34 NEVADA CENTRAL      °
 ° 3 ARIZONA EAST    ³ 19 ILLINOIS EAST    ³ 35 NEVADA WEST         °
 ° 4 ARIZONA CENTRAL ³ 20 ILLINOIS WEST    ³ 36 NEW_HAMPSHIRE ALL   °
 ° 5 ARIZONA WEST    ³ 21 INDIANA EAST     ³ 37 NEW_JERSEY          °
 ° 6 DELAWARE ALL    ³ 22 INDIANA WEST     ³ 38 NEW_MEXICO EAST     °
 ° 7 FLORIDA EAST    ³ 23 MAINE EAST       ³ 39 NEW_MEXICO CENTRAL  °
 ° 8 FLORIDA WEST    ³ 24 MAINE WEST       ³ 40 NEW_MEXICO WEST     °
 ° 9 GEORGIA EAST    ³ 25 MICHIGAN EAST    ³ 41 NEW_YORK EAST       °
 °10 GEORGIA WEST    ³ 26 MICHIGAN CENTRAL ³ 42 NEW_YORK CENTRAL    °
 °11 HAWAII 1        ³ 27 MICHIGAN WEST    ³ 43 NEW_YORK WEST       °
 °12 HAWAII 2        ³ 28 MISSISSIPPI EAST ³ 44 RHODE_ISLAND ALL    °
 °13 HAWAII 3        ³ 29 MISSISSIPPI WEST ³ 45 VERMONT ALL         °
 °14 HAWAII 4        ³ 30 MISSOURI EAST    ³ 46 WYOMING EAST        °
 °15 HAWAII 5        ³ 31 MISSOURI CENTRAL ³ 47 WYOMING EAST_CENTRAL °
 °16 IDAHO EAST      ³ 32 MISSOURI WEST    ³ 48 WYOMING WEST_CENTRAL °
 °                   ³                     ³ 49 WYOMING WEST        °
 ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼
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 ÉÍÍÍÍÍÍÍÍÍÍ Lambert Zones ÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÑÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ»
 °50 ALASKA 10     ³71 LOUISIANA NO  ³92 OHIO NORTH ³113 VIRGINIA NO  °
 °51 ARKANSAS NORTH³72 LOUISIANA SO  ³93 OHIO SOUTH ³114 VIRGINIA SO  °
 °52 ARKANSAS SOUTH³73 LOUISIANA OFFS³94 OKLA NORTH ³115 WASHINGTON NO°
 °53 CALIFORNIA I  ³74 MARYLAND ALL  ³95 OKLA SOUTH ³116 WASHINGTON SO°
 °54 CALIFORNIA II ³75 MASS. MAINLAND³96 OREGON NO  ³117 W_VIRGINIA NO°
 °55 CALIFORNIA III³76 MASS. ISLAND  ³97 OREGON SO  ³118 W_VIRGINIA SO°
 °56 CALIFORNIA IV ³77 MICHIGAN NO.  ³98 PENN. NORTHÀÄÄÄÄÄÄÄ¿          °
 °57 CALIFORNIA V  ³78 MICHIGAN CEN. ³99 PENN. SOUTH        ³          °
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°58 CALIFORNIA VI ³79 MICHIGAN SO.  ³100 S_CAROLINA NORTH ³          °
°59 CALIFORNIA VII³80 MINNESOTA NO. ³101 S_CAROLINA SOUTH ³          °
°60 COLORADO NORTH³81 MINNESOTA CEN.³102 S_DAKOTA NORTH   ³          °
°61 COLORADO CNTRL³82 MINNESOTA SO. ³103 S_DAKOTA SOUTH   ³          °
°62 COLORADO SOUTH³83 MONTANA NO.   ³104 TENNESSEE ALL    ³          °
°63 CONNECTICUT   ³84 MONTANA CEN.  ³105 TEXAS NORTH      ³          °
°64 FLORIDA NORTH ³85 MONTANA SO.   ³106 TEXAS NORTH_CNTRL³          °
°65 IOWA NORTH    ³86 NEBRASKA NORTH³107 TEXAS CENTRAL    ³          °
°66 IOWA SOUTH    ³87 NEBRASKA SOUTH³108 TEXAS SOUTH_CNTRL³          °
°67 KANSAS NORTH  ³88 NY LONG_ISLD  ³109 TEXAS SOUTHÚÄÄÄÄÄÙ          °
°68 KANSAS SOUTH  ³89 N_CAROLINA    ³110 UTAH NORTH ³119 WISCONSIN NO°
°69 KENTUCKY NORTH³90 N_DAKOTA NORTH³111 UTAH CNTRL ³120 WISCONSIN CE°
°70 KENTUCKY SOUTH³91 N_DAKOTA SOUTH³112 UTAH SOUTH ³121 WISCONSIN SO°
ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÏÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼
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     ÉÍÍÍ Alaska Mercator Zones ÍÍÍÍÍÍÍÍ»
     °  122 ALASKA 2                    °
     °  123 ALASKA 3                    °
     °  124 ALASKA 4                    °
     °  125 ALASKA 5                    °
     °  126 ALASKA 6                    °
     °  127 ALASKA 7                    °
     °  128 ALASKA 8                    °
     °  129 ALASKA 9                    °
     °  130 ALASKA 1_Oblique            °
     ÈÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍÍ¼
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Appendix D: Requirements to Release Matrix

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
S1.0						✔	This requirement is dropped since it is a headline.
S1.1						✔	This requirement is dropped since it is a definition statement
S1.2						✔	This requirement is dropped since it is a definition statement
S1.3						✔	This requirement is dropped since it is a definition statement
S1.4						✔	This requirement is dropped since it is a definition statement. The aspect of combining computation and data collection device is dropped due to the decision of not supporting the control of data collection devices.
S1.5						✔	This requirement is dropped since it is a definition statement. The aspect of input to data collection devices will only be supported for writing to pre-defined file formats.
S1.6						✔	This requirement is dropped since it is a definition statement
S1.7						✔	This requirement is dropped since it is a definition statement.
S1.8						✔	This requirement is dropped since it is a definition statement.
S1.9						✔	This requirement is dropped since it is a definition statement. The aspect of creating a setup file is dropped.
S1.10						✔	This requirement is dropped due to its ambiguity.
S1.11						✔	This requirement is dropped since it is a definition statement.
S1.12						✔	This requirement is dropped since it is a definition statement.
S1.13						✔	This requirement is dropped since it is a definition statement.
S1.14						✔	This requirement is dropped since it is a definition statement.
S1.15						✔	This requirement is dropped due to its ambiguity. The aspect of setting up for collection of measurements is dropped since collection is supported only through formatted files.
S1.16						✔	This requirement is dropped since it is a definition statement.
S1.17						✔	This requirement is dropped since it is a definition statement.
S1.18						✔	This requirement is dropped since it is a definition statement.
S1.19						✔	This requirement is dropped since it is a definition statement
S1.20						✔	The aspect of definition in this requirement is dropped.
S1.21						✔	This requirement is dropped since it is a definition statement.
S2.0	✔	✔		✔			This requirement is dropped due to its ambiguity.
S2.1	✔	✔					The aspect of this requirement covers only exchange of information through file formats. A set of new formats is delivered by each release.
S2.2	✔	✔					The aspect of this requirement covers only exchange of information through file formats. A set of new formats is delivered by each release.

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
S2.3	✔	✔					The aspect of this requirement covers only exchange of information through file formats. A set of new formats is delivered by each release.
S2.4	✔	✔		✔			The aspect of COGO computations covers planar calculations in the first release and geodetic and BLM specific COGO calculations in the subsequent releases.
S2.5	✔	✔		✔			
S3.0	✔	✔		✔			
S3.1	✔	✔		✔			The aspect to maintain templates is dropped.
S3.2	✔	✔		✔			The aspect to maintain a search library is dropped.
S3.3	✔	✔		✔			The aspect of supporting meta information will be supported in future releases after clarifying ambiguity in requirement.
S3.4	✔	✔		✔			The aspect of hyper linking will be supported in future releases after clarifying ambiguity in requirement.
S3.5	✔	✔		✔			The aspect of supporting meta information will be supported in future releases after clarifying ambiguity in requirement.
S3.6	✔						
S3.7	✔	✔		✔			The aspect of downloading data from various sources will be supported from subsequent releases..
S3.8	✔	✔		✔			The aspect of pointers will be supported in future releases after clarifying ambiguity in requirement.
S4.0						✔	The aspect of field survey setup will be supported in future releases after clarifying ambiguity in requirement.
S4.1						✔	The aspect of configuring field systems is dropped since ESRI software will not support configurations of in-field data collector equipment, configuration and field survey setup files.
S4.2	✔						
S4.3						✔	The aspect of applying the setup file and configure data using a transactional framework that confirms all parameters have loaded properly. will be dropped.
S4.4						✔	The aspect of applying the setup file will be dropped.

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
S6.0						✔	The aspect of applying real time data collection will be dropped due to ambiguity in requirement.
S6.1						✔	The aspect of supporting real time data collection will be dropped due to ambiguity in requirement.
S6.2						✔	The aspect of supporting real time data reduction will be dropped due to ambiguity in requirement.
S7.0	✔	✔		✔			The aspect of COGO computations covers planar calculations in the first release and geodetic and BLM specific COGO calculations in the subsequent releases.
S7.1	✔	✔		✔			The aspect of COGO computations covers planar calculations in the first release and geodetic and BLM specific COGO calculations in the subsequent releases.
S7.2	✔						
S7.3	✔						
M1.0						✔	This requirement is dropped since it is a definition statement.
M1.1						✔	The aspect of iteration limit and residual tolerance is dropped due to the development of coincident checking algorithms in ESRI core software.
M1.2						✔	This requirement is dropped since it is a definition statement.
M1.3						✔	This requirement is dropped since it is a definition statement.
M1.4							This requirement is dropped since it is a definition statement.
M1.5	✔						This requirement is dropped since it is a definition statement.
M1.6						✔	The aspect of iteration limit and residual tolerance is dropped due to the development of coincident checking algorithms in ESRI core software.
M1.7						✔	This requirement is dropped since it is a definition statement.
M1.8						✔	This requirement is dropped since it is a definition statement.
M1.9	✔						The aspect of measurement network is dropped due to the ambiguity between field survey and 'GCDB' measurement network.
M1.10	✔						This requirement is dropped since it is a definition statement.
M1.11	✔						This requirement is dropped due to ambiguity in its definition statement.
M1.12	✔						
M1.13						✔	The aspect of iteration limit and residual tolerance is dropped due to the development of coincident checking algorithms in ESRI core software.

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
M1.14						✔	This requirement is dropped since it is a definition statement.
M1.15						✔	This requirement is dropped since it is a definition statement.
M2.0	✔						This requirement is dropped due to ambiguity in its definition statement.
M2.1	✔						The aspect of COGO computations covers planar calculations in the first release and geodetic and BLM specific COGO calculations in the subsequent releases
M2.2	✔						The aspect of COGO computations covers planar calculations in the first release and geodetic and BLM specific COGO calculations in the subsequent releases.
M3.0	✔						This requirement is dropped since it is a definition statement.
M3.1	✔						The aspect of anomaly detection options and manage weighting on the selected set of measurements will be supported in the subsequent releases.
M3.2	✔						The aspect of pre-adjustment is performed through the adjustment analysis.
M3.3	✔						
M3.4	✔	✔		✔			The aspect of robusting will be supported subsequent releases.
M3.5	✔	✔		✔			The aspect of snoop values will be supported subsequent releases.
M3.6	✔						The aspect of survey data does not include misclosure of areas only traverses and will thus only be supported under SM.
M4.0						✔	This requirement is dropped since it is a definition statement.
M4.1	✔	✔		✔			The aspect of spreadsheet is dropped due to the ambiguity in the requirement definition and supporting technology.
M4.2	✔	✔		✔			The aspect individual error estimates will be supported in subsequent releases.
G1.0					✔		
G1.1	✔						
G1.10	✔						
G1.11	✔					✔	The dropped aspect of the requirement is that the system will support the use of feature metadata to properly construct features. It was dropped because the requirement is ambiquous.

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
G1.12	✔		✔				The aspect of the requirement to be delivered in R3 is for the system to support primary - foreign key joins to external applications/databases and the validation of primary keys.
G1.13			✔				
G1.14			✔				
G1.15			✔				
G1.16	✔	✔	✔				The aspect of the requirement to be included in R2 is for the system to provide tools to manage and report the state of a feature. The aspect of the requirement to be included in R3 is for the system to support external applications that manage land projects.
G1.17	✔		✔				The aspect of the requirement to be included in R2 is for the system to record various date related aspects of parcel features.
G1.18			✔				
G1.19	✔					✔	The aspect of the requirement that was dropped is that the system must support operational deployments that have a variety of database management configurations.
G1.2	✔						
G1.20						✔	
G1.21			✔				
G1.3	✔		✔				The aspect of the requirement to be delivered in R3 are those related to Parcels and parcel transactions.
G1.4		✔					

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
G1.5	✔	✔					The aspects of the requirement to be delivered in R2 include those that require that the system support construction and division within multiple nested/hierarchical features of a survey system, manage legal description fabric division to the required levels of the system, and support further legal description fabric subdivision to lower levels as needed
G1.6	✔		✔				The aspect of the requirement to be delivered in R3 support the use of multi-part polygons to represent single parcels
G1.7	✔	✔	✔				The aspect of the requirement to be delivered in R2 is the requirement to convert data imported from coverages containing splined curves created by COGO to true curves. The aspect of the requirement to be delivered in R3 is the requirement to the define Parcels with curved boundaries.
G1.8		✔	✔				The aspect of the requirement to be delivered in R3 is the requirement to provide feature linked annotation of Parcel dimensioning based on legal description text.

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
G1.9	✔		✔				The aspects of the requirement to be delivered in R3 are those related to management of measurements and parcel-based features as a multi-tiered network of associated object features by the NILS data architecture and production tools.
G2.0	✔						
G2.1	✔						
G2.2	✔		✔				The aspects of the requirement to be delivered in R3 is the requirement to provide tools to place all parcel numbers in a tier of parcels that lie on a common street segment such that a line through the labels runs parallel to the street.
G2.3	✔						
G2.4	✔		✔				The aspects of the requirement to be delivered in R3 are those related to navigating to a nominal location or a legal description area.
G3.0					✔		
G3.1	✔						
G3.2	✔						
G3.3				✔			
G3.4			✔				
G3.5	✔		✔				
G4.0	✔						
G4.1	✔						
G4.2	✔						
G4.3	✔						

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
G4.4	✔					✔	The dropped aspect of the requirement is the requirement to provide tools to convert to/from orthometric height and ellipsoidal height (GPS gives ellipsoidal heights, conventional vertical benchmarks give orthometric height).
G4.5	✔					✔	The dropped aspect of the requirement is the requirement to support a multi-user environment in which data and databases are distributed
G4.6	✔		✔			✔	The aspects of the requirement to be delivered in R3 are those related to parcel editing and versioning. The dropped aspect of the requirement is to meet performance requirements because it is vague and reasonable performance requirements are already implied for the entire NILS system.
G4.7	✔						
G4.8	✔						
G5.0						✔	
G5.1	✔						
G5.2	✔					✔	
G5.3	✔		✔				
G5.4	✔						
G5.5	✔						
G5.6	✔						
G5.7	✔						
G5.8	✔						
G5.9	✔	✔					
G6.0	✔						
G6.1		✔					

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
G6.2			✔			✔	The dropped aspect of the requirement is the relating to associating documents and jobs because it is unclear and will be redundant in light of the work that will be done later to integrate NILS with the document management system BLM is developing.
G6.3	✔						
G6.4	✔						
G6.5			✔				
G6.5.1	✔						
G6.5.2	✔		✔				The aspect of the requirement to be delivered in R3 is the requirement to support updates to the Parcel fabric based on land transactions and updates to the legal description fabric.
G6.5.3			✔				
G6.5.4	✔						
G6.5.5	✔						
G6.5.6		✔					
P1.0					✔		
P1.1			✔				
P1.2			✔				
P1.3			✔				
P1.4			✔				
P1.5			✔				
P1.6			✔				
P1.7			✔				
P1.8		✔					
P1.8.1		✔					
P1.8.2		✔					
P1.8.3		✔					

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
P1.8.4		✔					
P1.8.5		✔					
P1.8.6		✔					
P1.8.7		✔					
P1.8.8		✔					
P1.8.9		✔					
P1.8.10		✔					
P1.8.11					✔		
P1.9	✔						
P1.10	✔						
P1.11			✔				
P1.12			✔				
P1.14			✔				
P1.16			✔				
P1.17			✔				
P2.0			✔				
P2.1	✔		✔				
P2.2			✔				
P2.2.1			✔				
P2.2.2			✔				
P2.3			✔				
P2.4			✔				
P3.0		✔					
P3.1			✔				
P3.2		✔					
P3.3	✔		✔				The aspect of the requirement to be delivered in R3 is to allow users to compare/contrast edit 'versions' against the sketch and the fabric to validate geometry and attributes and to validate the legal geometry.

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
P4.0	✔	✔					The aspects of the requirement to be delivered in R2 are to provide an editing environment that manages database transactions uniquely in support of auditing and history and enforce data integrity.
P4.1		✔					
P4.2	✔	✔	✔				The aspects of the requirement to be delivered in R2 are the requirements to store procedures used to resolve legal description conflicts and differences for each decision, provide choices to return, exit, or commit working version prior to session closure, provide choices for newly constructed legal description component, and vlidate insertion according to topology rules. The aspect of the requirement to be delivered in R3 is to validate insertion according to business rules.
P4.3	✔		✔				The aspect of the requirement to be delivered in R3 is to assist user to control the type and extent of automatic geometric updating that occurs among features which have geometric/topological associations.
P5.0	✔						
P5.1	✔						
P5.2	✔						
P5.3	✔						

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
P5.4	✔	✔	✔		✔		The aspects of the requirement to be delivered in R2 are to process associations iteratively until complete, to persist adjustments into the database, to save the adjusted control and fabric and the adjustment coefficients. The aspects of the requirement to be delivered in R3 are to automate changes to the geometry of the target fabric into any associated fabrics, to assist in the analysis/evaluation of the adjustment, to provide the ability to toggle between the 'technical' and the 'cartographic alignment' adjustment, and to provide choices for re-adjustment. The aspect of the requirement to be decided is to construct a new measurement database if the target fabric is not based on measurements.
P6.0			✔				
P6.1			✔				
P6.2			✔				
P6.3	✔		✔				The aspects of the requirement to be delivered in R3 are to provide tools to form parcels and edit attribute values (include COGO and Layout tools and computations), and to assist in assigning unique parcel identifiers.
P6.4			✔				
P6.4.1			✔				

DFF Req Number	SM/ MM 1.1	SM/ MM 2.1	PM 1.1	Later	TBD	Removed	Comment
P6.4.2			✔				
P6.4.3			✔				
P6.4.4			✔				
P6.5			✔			✔	The aspect of the requirement to be dropped is to invoke the document management system for selection list of potential documents to link. This has been dropped, because the specifics of the integration with the document management system are not yet known.
P7.0	✔		✔				The aspect of the requirement to be delivered in R3 are to allow the user to select the target fabric or measurement network and edits annotation, to provide a set of annotation editing tools to customize the annotation features, to allow users to define new annotation symbols, and to edit annotation to update to the target feature fabric or measurement network.
P7.1			✔				
P7.2	✔						